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ABSTRACT

A study examined commercially available computer software to ascertain its degree of congruency with current methods of reading instruction (the Interactive model) at the first and second grade levels. A survey was conducted of public school educators in Connecticut and experts in the field to determine their level of satisfaction with available software and to establish characteristics that educators value in the software they use to supplement their reading instruction. Identified characteristics were used in the formulation of an evaluation device. A total of 27 commercially available software titles underwent review. Laboratory reviews were conducted by individuals with ranging experience in education, including undergraduate students at the university, the researcher, and graduate students in reading at the university, who were also classroom teachers. Analyses after each review phase aided in determining the potential level of congruency each title had with the Interactive model, and thus its potential effectiveness. Laboratory reviews revealed 10 titles that appeared to be congruent; those titles were then field tested with first and second graders, which revealed additional strengths and weaknesses in each software package. Results indicated that the 10 finalists, considered to be the most educationally sound of what is available, have at best a fair (as opposed to good or excellent) amount of congruency with how reading is being taught. (Contains 52 references, a list of the software reviewed, and 7 tables and 8 figures of data. Appendixes contain cover letters, survey instruments, evaluation devices, criteria used for analyses, student evaluation of software, and the revised evaluation device.) (Author/RS)

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ED 410 544

Computer Software:

Does It Support a New View of Reading?

Carolyn J. Case

A Thesis
Submitted in Partial Fulfillment of the
Requirements for the Degree of
Master of Science
in Reading and Language Arts

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October, 1996

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To John,

for your ongoing patience, understanding, and support

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Abstract

The purpose of this study was to examine commercially available computer software in order to ascertain its degree of congruency with current methods of reading instruction at the first and second grade levels. Conducting a thorough educational review of the software required the development of an evaluation device that represents the reading instruction practiced by most educators today- the Interactive model of reading instruction. A survey was conducted of both public school educators around the state and experts in the field to determine their level of satisfaction with available software and to establish characteristics that educators value in the software they use to supplement their reading instruction. The identified characteristics were used in the formulation of the evaluation device with which the software was reviewed. Twenty-seven commercially available software titles underwent the review process, which consisted of three phases of review. Laboratory reviews were conducted by individuals with ranging experience in education, including undergraduate students at the university, the researcher, and graduate students in Reading at the university, who were also classroom teachers. Analyses after each review phase aided in determining the potential level of congruency each title had with the Interactive model, and thus its potential effectiveness as a supplemental tool for today's reading instruction. The laboratory reviews revealed ten titles that appeared to be congruent; those titles were then field-tested with actual first and second graders, which revealed additional strengths and weaknesses in each software package. The results of the study include: 1) an evaluation device that can be used by educators for reviewing software, and 2) recommendations regarding the

congruency and potential effectiveness of the remaining ten titles, including their strengths and weaknesses. The results of the laboratory reviews and field-testing suggest that the ten "finalist" titles, titles considered to be the most educationally sound of what is available, have at best, a *fair* amount of congruency with how reading is being taught today, as opposed to *good* or *excellent*.

INTRODUCTION

Each year computers become more prevalent in elementary schools. As their numbers increase and more attention is directed toward computers, educators are being faced with the task of deciding how to best utilize this technology. This decision includes the selection of quality software that will complement and enhance school instructional programs. At the first and second grade levels, one of the most important responsibilities teachers have is to teach students how to read. Recently, the computer has become recognized as being a viable tool for assisting students in acquiring and improving that ability.

Given the abundance of software available from publishing companies for supplementing the teaching of reading, selecting worthwhile software is an overwhelming and time-consuming job. Educators, with their limited time and funds, often feel like victims to the savvy marketing techniques of the publishing companies. Naturally, schools want to be able to make wise investments for their students.

The purpose of this study is to assist educators in the task of selecting software that can effectively supplement the reading instruction of first and second graders. This will be accomplished by providing: 1) a substantiated process for reviewing and selecting software and 2) a list of software titles that can be recommended as potentially effective supplements to an existing reading program. Assisting educators in the procedure of selecting software will help them to avoid the possibility of wasting their money on ineffective software as well as to save their valuable time and energy for other necessary functions. This study will assist educators to use computer technology in a way that will promote positive student learning in the area of reading and complement what is currently known about reading instruction through the development of an assessment tool.

Advanced technological abilities, such as the increasing intelligence capacity of computers, have resulted in extended opportunities for interaction between the computer and the user. The nature of this study is based on the assumption that publishing companies are making available educationally sound software that utilizes the unique features the computer has to offer. The possibilities for using the computer to help students learn to read are exciting based on these new capabilities. However, this technological capability only has a place in the classroom when the software is developed based on educationally proven practices.

The use of computers in schools has been described as a "Technology Revolution" (Mehlinger, 1996). Mehlinger purports that new technology has and will continue to be introduced to schools, and that there is no stopping it. In the dawn of the Information Age, as technology is used more frequently in day-to-day living, Mehlinger predicts that, futuristically, "technology will be used extensively in schools. That much is inevitable" (p. 407). In many cases, computers have been warmly received by teachers and students alike. Students are excited by computer-based instruction, and teachers feel the students can learn more through its use.

For the purposes of this study, computer-based reading instruction (CBRI) is defined as classroom instruction which involves students in the direct use of computer software programs in order to better their reading abilities in the areas of vocabulary, comprehension, and/or print skills. Activities completed and texts displayed on the computer screen are considered on-line activities, for example experiencing an interactive story with CD-ROM.

CBRI is often contrasted to traditional, or conventional, methods of reading instruction. These methods involve developing students' abilities through the customary instructional classroom practices, such as instruction that involves activities based on and utilizing a story in a basal or a trade book. Traditional reading instruction involves off-line activities, which are completed by students without the direct use of a computer.

Over the past thirty years, the computer has slowly become more visible and widely used in elementary school classrooms. Since its introduction into elementary education in 1963 as a tool to be used in reading instruction (Marsh, 1983), the computer has developed an increasingly important role in the classroom. Educators have realized both its value as a teaching aid and its growing presence as a communicative tool in everyday life. Today, 98% of schools have computers available to teachers and students for instructional purposes, either in a lab setting and/or in individual classrooms (Mehlinger, 1996).

As school districts invest greater percentages of their funds in computers, making them more accessible, teachers are expected to be using them increasingly for instructional purposes. Many educators have recognized the potential for using computers in a variety of subject areas. Recently some fascinating options have become available for using computers to supplement reading instruction specifically. In today's world of growing technological capabilities, teachers need to "educate themselves about the better software programs and incorporate computerized instruction into their classrooms" (Roberts, 1991, p. 295).

Envision the following fictitious first grade classroom. In this classroom, the computer is an actively integrated component in the daily happenings of the class. New opportunities for student achievement have been made possible due to the realization of the computer's exciting capabilities and usefulness as a learning tool. The computer is seen in a positive light by the teacher and students.

In this classroom, students' reading performance, ability, and development is enhanced by activities performed on the computer. Quality software that supplements the reading program of these beginning readers is utilized by individual students, small groups, and at times even the whole class. The teacher in this classroom assists the students in reaching their individual optimal reading potential with the help of effective computer software that supplements the regular reading program and challenges them at the appropriate level. This functional yet fictitious classroom could become reality.

Research has shown that student use of computer software designed to enhance reading development can result in reading success at all ages and ability levels (Darter & Phelps, 1990). Multiple studies have investigated the effectiveness of CBRI as compared to traditional forms of reading instruction and found the results to be favorable (Kamil, 1987; McConkie & Zola, 1987; Balajthy, 1987). Some studies have found CBRI to be just as effective as conventional reading instruction while others have found it to be even more effective (Darter & Phelps, 1990; Kulik, Kulik, & Bangert-Drowns, 1985; Thompson, 1992; Reinking, 1988).

In the past, much of the available software catered predominately to a skills-based approach of reading instruction. The drill and practice-type exercises of a particular skill presented in the software were often equated to "electronic workbooks," (Doyle, 1988, p. 239) and were displayed in a game-like fashion. Ten or fifteen years ago those skill and drill exercises were acceptable according to then-beliefs about how children learn how to read. However, based on what is now known about reading instruction, strictly skill and drill software no longer suits educational needs.

A prominent present-day view of reading employs some decidedly different elements than the reading programs of fifteen or more years ago. Although the importance of mastering skills is recognized, other factors need to be present as well. Interwoven in the new view is the emphasis on utilizing authentic, complete texts through which meaning can be constructed and skills can be developed simultaneously. This view contrasts seeing reading as merely a series of skills that are sequentially learned. The current view of reading employed by a large majority of educators is the Interactive model of reading (Stanovich, 1980).

According to Vacca, Vacca, and Gove (1995), teachers that subscribe to the Interactive model of reading include in their programs elements from both the Top-down and Bottom-up models of reading. All of these models view reading as a form of communication in which the goal is to construct meaning from the text. What differs in each model is what information is used and how readers use that information to create meaning from texts.

The Bottom-up model stresses the belief that meaning is constructed by first analyzing the print, or graphophonic information. Students must know how to decode the symbols of the written text into sounds and words before they can create meaning from it. This is done through teaching letter/sound and word identification skills in a sequential manner. Texts read are planned packages that require knowledge of only those skills that have been taught in order to read them. Precise accuracy of decoding ability is imperative and is developed through rereadings of material and students listening to their own reading. This model of reading is incorporated into the phonics and skills instruction of the "old" basals (pre-1987) (O'Brien, 1995) and commercially published kits, such as SRA's, and is how reading was taught for years.

Vacca, Vacca, and Gove (1995) describe the Top-down model as based on the belief that creating meaning from a text begins with accessing the students' background knowledge. Students use contextual and syntactic cues to make predictions about what the text says. The Top-down model is a newer precedent around which the elements of Whole Language lie. Comprehension is constructed from the whole text as opposed to individual letters or words. Mastery of a series of particular skills is not considered a prerequisite for reading. Students learning under this model are encouraged to choose their own material to read. Teachers provide meaningful activities with ample opportunities for students to read, write, speak, and listen.

Today, most teachers' philosophies tend to fall somewhere between the Top-down and Bottom-up models, which is the Interactive model. Few subscribe purely to one or the other (O'Brien, 1995). In the Interactive model of reading, the process of making meaning involves the elements of both models; students are encouraged to use information from the print *and* their background knowledge concurrently as they read. Teachers recognize the need to develop students' letter and word identification skills as one strategy for decoding, and they value teaching the use of contextual and syntactic cues as another aid. Students are taught many ways for figuring out what the text is conveying; no sources of information are used exclusively. They are encouraged to use components from both models, depending on the situation and the student's needs and abilities.

Texts used for instruction can take a variety of forms, such as "new" basals, trade books, environmental text, student-written material, etc. These authentic texts are not controlled by specific skill acquisition, but provide children with real reading situations. The development of skills and word identification occurs as it is applied to these authentic reading situations. They are no longer taught and practiced in isolation as was believed most effective in the skills-based instruction of fifteen or more years ago. Reading is also viewed as a social act in which students can learn a great deal from each other by experiencing a variety of ability levels.

In addition to the above described elements of today's view of reading, perhaps the fundamental component of becoming a successful reader and student is developing a love of reading. It is in first and second grade where students are formulating opinions and laying the groundwork that subsequent learning will be built upon. The importance of fostering the love of reading and a strong ability foundation in beginning readers cannot be denied. Reinforcing classroom reading instruction with computer use has been proven to supply a motivational force that can encourage a positive attitude in young readers (Rude, 1986). CBRI was found to result in increased student concentration and motivation producing an improved ability to attend (Goldman, 1989).

CBRI has also been found to provide students with an effective means of supplemental instruction (Balajthy, 1987). The advantages of using CBRI in the classroom as an additional tool for supplementing the teaching of reading are numerous. For example, the computer provides immediate feedback on performance and enduring, repeated practice when necessary; students have more positive attitudes toward learning as a result of CBRI; and computers provide a comfortable forum in which students with low self-esteem can participate (Darter & Phelps, 1990).

Kamil (1987) pointed out that computers are capable of being consistently objective about students' performance and can make some information more readily accessible. Weber and Henderson (1989) found CBRI to lead to more efficient reading, thereby facilitating the development of higher-level thinking skills (Tzung-yu, 1993).

Despite this array of advantages, Darter & Phelps (1990) note that "the computer was not found to be a panacea to all reading ills, and it is not a passing fad. The computer is a valuable tool to be used as part of the equipment of learning to read" (p. 22). Other studies also suggest that computers be used as a *supplement* to conventional instruction rather than a replacement (Balajthy, 1987; Thompson, 1992). Recommendations made as a result of this study adopt a similar perspective that computers are not meant to take the place of regular classroom tutelage, but to enhance it. It is recognized that since learning to read is a complex process, there is not *one* simple solution that will make all children accomplished readers.

In addition to being useful as a classroom tool for improving reading, computer experience at the first and second grade levels will benefit students in other ways. Since reading is an act of communication, children need practice using the most modern communicating devices available (Sponder, 1993). Given that computers are likely permanent fixtures in our society, as educators it is our job to be sure that children become familiar with electronically-displayed texts. Using computers also increases knowledge and use of computer language, producing computer-literate individuals (Genishi, McCollum, & Strand, 1985). Considering the expanding frequency of computer use, it has even been suggested that the definition of literacy be altered to include the act of reading and writing electronically (Kamil, 1987; Reinking, 1994).

In spite of all the advantages, the effectiveness of CBRI relies heavily on the software chosen. In the recent past, educators have become frustrated with the available skill and drill software as it doesn't suit the new view of reading (Isaak & Joseph, 1989; Reinking, 1989). There is an abundance of packaged instructional software offered and often pushed by publishers that is lacking in educational quality (Isaak & Joseph, 1989; Balajthy, 1987). However, the present-day technological capabilities have opened the door for a whole new vein of CBRI through an improved quality of software.

When using computers for instruction, Wilkinson (1983) points out that it is important for on-line texts to utilize the unique features computers have to offer. Simply using a computer to do what could be done by conventional means will not necessarily result in increased achievement. CBRI will be most beneficial to students when the unique capabilities that computers offer are tapped, for example utilizing a moving graphic to supply additional information or illustrate an idea.

Additionally, it would be unwise to have students complete activities on the computer that are not congruent with, and at the same caliber of, other pedagogically sound classroom activities. Educators, in their quest to develop competent readers, should demand software that is child centered, process-oriented, motivational, and parallels the sound educational practices that are provided in the classroom.

Unfortunately, one needs only to peruse one software catalog to realize the immensity of the task of separating the worthwhile software from the inadequate. Program descriptions will often include what publishing companies deem unique educational software features alongside enthusiastic quotes by satisfied users. The end result is that each software program may appear, on paper, to be a beneficial supplement to any reading program. This may simply not be the case.

In the educational world where every year involves increasing responsibilities and additional curricula, teachers and media specialists may not have the time, knowledge, or desire to weed through the pool of available software to develop a library or list of effective software for student use. Given the plethora of software choices, educators would benefit from information regarding available software that will complement the new view of reading and positively affect reading achievement.

This study is intended to help educators realize the benefits and positive effects of CBRI based on the new technology, as well as provide them with a process for selecting software and recommendations for effective software. This information will help educators in numerous ways, including assisting educators in providing quality individualized instruction and saving time and money spent on selecting software that may be inadequate. In addition, students may be exposed to useful supplements to their reading instruction, which could help them to become better readers.

Statement of Need

A review of the literature reveals many studies that have been done on the use of computers in reading, including their efficacy, how they are used, the benefits and drawbacks, and recently, with the growing popularity of CBRI, reviews of available software. While these reviews are thorough in covering the technical aspects of a software package, what is typically lacking is information regarding the educational soundness of the software. Additionally, there are no reviews that focus exclusively and comprehensively on the software that is available for supporting reading programs.

Studies have shown that CBRI can be effective, and that the majority of classrooms are either equipped with computer technology or have easy access to it (Rude, 1986; Thompson, 1992). Despite these facts, many teachers are not consistently using computers to supplement their instruction of reading (Reinking & Bridwell-Bowles, 1991). This could be due to many factors including, but not limited to, teachers' lack of training on computers, lack of time to familiarize themselves with the hardware and software, and/or lack of awareness of relevant, quality software.

This study attempts to alleviate for educators the steps of locating, perusing, and selecting proven quality software, which classroom teachers and media specialists may not have extended time for nor feel confident doing. Through becoming aware of effective software, teachers will concurrently gain knowledge of various hardware options that can enhance CBRI.

When put to the task of selecting software that will enhance a reading program, educators are faced with stacks of catalogs that are filled with a virtual sea of software that does not always reflect sound reading instruction (Reinking, 1989). Choosing quality can seem like a shot in the dark. This study involves an integrative review of what is available, resulting in a list of titles that may be beneficial as a guide for educators.

Schools will no longer have to play a guessing game of which software is beneficial, and they can begin using computers optimally to continue to help students reach their highest potential of learning. It is no longer a question of "if" computers should be used, but "how" they can be used most effectively to teach reading.

Purpose

In order to keep the development of technology-use moving in an educationally beneficial direction, it is necessary to examine the software that is available. Teachers, students, and publishing companies alike will benefit from knowing what characteristics effective computer software exhibit and titles of software that demonstrate those characteristics.

Therefore, the purpose of the study is two-fold. One question the study examined is **"What common characteristics should effective computer software that can be used to supplement an Interactive model of teaching reading in the first and second grades have?"** First, current research and experts in the field were consulted in order to establish the criteria used to evaluate the quality of computer software that complements an Interactive model of reading. Once these characteristics were established, they were organized into an evaluation device in the form of a checklist that was used in determining the effectiveness of available computer software.

The second part of the study involved a review of a variety of computer software intended to supplement first and second grade level reading programs. The evaluation device described above was used to identify quality computer software that can be recommended for use as an effective supplement to a reading program utilizing an Interactive model. Subsequently, the second question the study examined is **"What computer software titles can be included in a comprehensive list of effective software that supports an Interactive model of reading instruction in first and second grades?"** This list will be made available to classroom teachers, media specialists, and other educators as recommended titles that appear to be effective in the classroom or computer lab setting.

Limits of Project

Although this study makes recommendations regarding titles of effective software, it does not address how that software should be used in the classroom. As with any instructional tool, how it is used by the teacher will be a factor in determining the degree of student success. However, this study does not address how each title would be best used. Additionally, this study does not report on the software's specific effects on individual students. As part of the software review process, the software was observed under direct student use, but not for the purpose of discovering how the software was affecting individual students' ability.

Despite the acknowledgment of the benefits of integrating reading and writing, the study does not address software intended primarily to aid in writing, such as word processors. It was anticipated that the link between reading and writing would be apparent in some software and therefore be addressed informally as appropriate during the study. However, the scope of this study would be too vast to formally include software specific to writing in addition to evaluating software specific to reading.

Recently there has been a growing interest in the use of computers for diagnosis of reading difficulties, hence an enlarging market for software that suits this use. However, as this is a study of effective computer-based reading instruction, implying students' direct use of a computer to enhance their reading ability, it will not address the diagnosis of such difficulties. Diagnosis is a separate step that should be performed prior to instruction that applies the software that is reviewed in this study.

Consider, once again, the fictitious classroom described previously where students were actively engaged in reading instruction and making gains through the supplemental use of the computer. This classroom already is a reality in many schools where educators have realized the full potential of CBRI in reading and have adapted it to fit the new view of reading.

The success of any computer-based reading instruction program is going to depend, in part, on the quality of the software chosen to be utilized by the students. A lot of what was available in the past, and even much of the software that is offered today, does not coincide with what is now known about effective reading instruction. Educators will benefit from having available a list of titles that appear most effective in meeting students' needs in reading instruction.

As a result of the described software review and analysis, the study results in identifying several titles that can be included in such a list of recommended software that best meets today's standards of an Interactive model of reading. As of 1989, Reinking noted that the function of much of the available software didn't correspond with what we know about reading instruction. In his eyes, software didn't necessarily reflect sound educational thinking. This study, through weeding out the effective software from the ineffective, reveals that the educational quality of software is improving, but there is still much room for growth. Since CBRI can be such an effective method, access to quality software is crucial in order to justify a school spending excessive funds on the technology.

REVIEW OF THE LITERATURE

History of CBRI: 1963 - Present

Computer-based instruction was formally used as a method for teaching reading at the elementary school level initially in 1963 under the direction of the Stanford project (Marsh, 1983). This federally funded project was a beginning attempt at creating a computer-based reading curriculum. At that time it was thought that computers could one day effectively replace teachers. Pioneering technology consisted of Integrated Learning Systems, which were individual terminals connected by cable to a powerful, central mainframe computer (Balajthy, 1996). Students at the terminals could access only the software the mainframe was programmed for. Because of this arrangement, initial programs, such as those of the Stanford project, were inclusive by nature in order to maximize the use of the software by the majority of the students (Reinking & Bridwell-Bowles, 1991).

Consequently, computers didn't become widely used in schools until the mid- to late-1970s when microcomputers became available (Reinking & Bridwell-Bowles, 1991). Unlike the original mainframe computers, the microcomputers that are used today function independent of a mainframe. This autonomy allows more individualization of instruction by providing the freedom of choice in selecting the software used by each student.

In the past, CBRI has involved software that teaches and drills specific skills, for example phonics skills like vowel sounds and rhyming. Through computer programming, students were introduced to the new skill, provided with examples of that skill, and then had an opportunity to practice the skill, often through a game format. The limited technology available in the 1960s, 1970s, and into the 1980s was capable of producing, in essence, "electronic workbooks" (Doyle, 1988, p. 239). The same activities presented in basals and workbooks were simply transferred to floppy disks so that they could be completed on the computer. Naturally, programs that offered this type of skill practice produced results equal to those of worksheets (Mason, 1985).

The advancement and evolution of technology over the years has resulted in an increased use of the computer in the educational setting. The U.S. Department of Commerce (1994) reports that in 1993, the average ratio of students per computer in the public school was 12:1 as opposed to 63:1 in 1985. The report goes on to show that, in 1993, the use of computers for literacy instruction accounted for 13% of school computer-use time, ranked third behind mathematics instruction (15%) and keyboarding instruction (14%). As of the end of 1995, there were 1011 software titles for literacy education available commercially, 16% of which were published in 1995 (Balajthy, 1996b). These data suggest that computer technology is here to stay.

Today's more advanced technology offers increased intelligence and capability as seen with the development of the CD-ROM, which stands for compact disk- read-only memory. CD-ROMs, with their increased available memory over floppy disks, have allowed for increased interaction and improved graphics and sound- assets for students experiencing electronic books, also referred to as interactive books or computer-mediated texts.

Electronic books are programs that can maintain a text, such as a children's book, in its original form, including the text and pictures. However, because they are on a disk, they provide more options for experiencing the story. Students can have the story or text read to them by the computer, or they can read a story on their own with the opportunity to get help from the computer, if necessary, when identifying words or clarifying a concept. The size and font of the actual text can also be modified to accommodate individual learners (Miller, Blackstock, & Miller, 1994). These are options a traditional book can not offer when used independently by a child (McKenna & Watkins, 1995). Electronic books are an exciting new tool that show promise for supporting literacy education (Balajthy, 1996a).

Having these computer-mediated texts available has revealed some interesting possibilities for education. Electronic books have been shown to: 1) make reading more enjoyable and less frustrating; 2) aid in developing decoding skills and therefore improving fluency; and 3) provide effective individual support, or "electronic scaffolds" (McKenna, Reinking, Labbo, & Watkins, 1996, p. 1). Additionally, reading ability can improve dramatically through increased sight word recognition, a result of being able to access the computer's pronunciation of unknown words (Miller, Blackstock & Miller, 1994). Computer-mediated texts also allow for vocabulary development, as definitions of unknown words can be available to students.

Necessary Commitments of Schools Using CBRI

The decision by a school district to use technology for educational purposes requires substantial financial and time commitments. In order for computer use to be most effective, students need to have adequate access to computers (Mehlinger, 1996). Many schools are equipped with a computer lab (a room or area containing several machines where all or half of the class can work simultaneously) and/or have at least one computer in each classroom (Mehlinger, 1996). Generally, more computers in a school will allow for increased student access and use of the technology. Equipping a school with computer systems, including the necessary hardware and software, involves a substantial initial cost (Kamil, 1987). In addition, considering the rapid advancements that technology is making, current equipment will very likely be obsolete in a relatively short amount of time, resulting in the need for constant updating of systems.

Another element that needs to be factored in to the decision of using technology is the provision of time for those purchasing and using the technology (Robinson, 1990). Selecting the appropriate hardware and software requires the time to consider all options, which are numerous, and match them to the school's needs. Once the product choices have been made, planning time is needed for the teachers to learn how to use the technology so that they can best instruct their students on the equipment. In an interview, Balajthy recommended 200 hours of inservice time for teachers to learn how to implement CBRI into their curricula (Robinson, 1990).

CBRI versus Traditional Instruction

In a country consisting of rapidly growing technological capabilities coupled with increasing concern over its ability, or lack thereof, as a "nation of readers," it is wise to examine the possibilities of utilizing CBRI for improving the reading achievement of our students. Given the extensive commitments that are required by a school for using computers for instruction, careful consideration has wisely been given as to whether this technology is a prudent investment. Much of the research conducted has pertained to the efficacy of using computers to supplement reading instruction, resulting in significant controversy (Tzung-yu, 1993). Many research studies have been conducted in order to establish how effective CBRI can be as compared to other more traditional methods (Thompson, 1992; Darter & Phelps, 1990; Tzung-yu, 1993; Balajthy, 1989). The results have varied.

Studies that reveal concerns regarding the effectiveness of CBRI. Consideration of the results of various studies in conjunction with the disadvantages of using computers (and naturally there will be disadvantages to any method) have caused some researchers to believe that CBRI cannot be warranted as a proven method of reading instruction (Thompson, 1992). Members of this school of thought uphold that increased ability can be achieved without computers, and that just because this technology is newer does not mean it is better instruction than traditional methods (Thompson, 1992).

In a review and analysis of 29 investigations of CBRI, more than a third of the studies, 34.5%, found the computer-based reading instruction to be superior to traditional methods of instruction, while 38% of the studies reported equal results between CBRI and traditional instruction (Thompson, 1992). While a one-third superiority rate raises noteworthy implications, Thompson (1992) believed it was far below the 50% criterion standard necessary for suggesting significance. He concluded that, while there seemed to be interesting data supporting the efficacy of CBRI, and that there was potential for it to be at least as effective as conventional methods, "there is insufficient evidence to justify the conclusion that [CBRI] is more effective than traditional teacher directed instruction" (p. 69).

Darter & Phelps' review (1990) of studies regarding the results of CBRI found that in some cases it had no statistical benefits over traditional instruction pertaining to reading development and comprehension achievement of students. While CBRI did help some students to improve basic skills, these were not carried over to off-line activities. In another study, children were reported to prefer CBRI, but this did not seem to increase their attention to the task at hand, nor did they perform at a higher level than when they were working with print. In another research review by Tzung-yu (1993), one study found that there was no significant difference in students' reading ability between those who utilized CBRI and those that experience only off-line text, as related to comprehension and reading efficiency.

In addition to the studies above that described the outcomes of CBRI as compared to conventional teaching methods, there are disadvantages to using the computers themselves. Cost, quality of software, and potentially reduced social interactions between students are just some of the drawbacks of replacing traditional instruction with CBRI.

During a time when school funds are diminishing, the financial commitment of outfitting a school with computers and maintaining them can be overwhelming and even impossible. Such an investment may also be undesirable given that some studies show no great advantage in using CBRI. Taxpayers, rightly so, may question the prudence of spending exorbitant amounts of money on something that does not guarantee results superior to what is currently being done in classrooms.

Part of maintaining a computer system involves selecting software that complements the reading program. A common concern in the past has pertained to the lack of quality software that is available (Reinking, 1989), in that it does not coincide with good pedagogical practices. For example, a substantial amount of the software available employs a skill & drill format that teaches skills in isolation (Reinking, 1989). Software designs often present skills that are not practiced in a meaningful way, and may be different than how they were first taught in the classroom, creating incoherence (Miller & Burnett, 1987).

The game-like construction of many software programs does attract children's attention and motivate them, which is encouraging, but often distracts them from the important aspects of the activity resulting in more harm than if they were practicing the skill in a traditional activity (Reinking, 1987). Taking advantage of the motivational aspects of CBRI, many publishing companies are producing software that contains a high entertainment level through the interaction options that are offered that often detract from and outweigh the educational value (Balajthy, 1995). The animated graphics presented in certain software can pose a similar problem in that some actually take students' attention away from the text when the animations are unrelated to the text, rather than enhance it (Reinking, 1989). The above distractors hinder student progress and would not be as strong of a factor in traditional instruction.

Another concern with CBRI is the potential for isolating students from social interactions as they sit down by themselves to work with a machine (Rude, 1986). The importance of human contact to learning cannot be denied, whether it's with the teacher or peers. A computer can't successfully provide the interaction or benefit of the human touch. One concern was that the use of computers for instruction would reduce these necessary exchanges and communications between student and teacher and student and student (Genishi, McCollum, & Strand, 1985).

Finally, an important part of learning to read and refining skills and strategies is being able to read to someone and gaining feedback from that experience. The computer is neither able to listen to a student read nor provide feedback on one's ability to read orally (Kamil, 1987). The computer cannot tell when a word is misread or mispronounced and correct the miscue.

Studies that promote effectiveness of CBRI. In isolation, the above arguments make a reasonable case for avoiding CBRI as a method for instructing emergent readers. However, additional studies present convincing information that does reflect educationally-sound thinking. The advantages of employing computer-use in the classroom are quite exciting, with new capabilities continually being introduced. The advancement of technology has produced several features that make the computer a unique tool for assisting in reading instruction. Reinking (1986) noted six such benefits when he illustrated the computer's ability to: 1) allow readers to literally interact with text, 2) exercise control over what students attend to, 3) make a rather ordinary task more exciting, 4) individualize instruction, 5) authenticate communication, and 6) record-keep.

Darter and Phelps (1990) noted the following opportunities that CBRI can offer. Some software has been programmed to provide immediate feedback to responses in situations where it's appropriate and useful- a proven technique for improving readers' abilities. Working on a computer can provide a comfortable and safe forum for students with low self-esteem, as they can participate in an activity in a private setting and take risks without the fear of public humiliation. Computers also have the ability to patiently administer seemingly endless repeated practice for skills requiring development. As the computer takes over some of the mundane functions of teaching it saves planning time for the teacher while freeing him/her to be able to accomplish other goals. It has also been shown to save student time as they master skills and strategies faster on the computer than with traditional instruction.

Additional research has shown that the characteristics of CBRI have resulted in increased student motivation and positive attitudes toward reading (Darter & Phelps, 1990; Kamil, 1987; Tzung-yu, 1993). Many students (children and adults alike) react enthusiastically to working on the computer because it is rewarding. The importance of tapping into a student's affective domain has been recognized to be a powerful tool for supporting student success. Other studies show this increased motivation has led to extended concentration and ability to attend (Goldman, 1989).

Furthermore, the computer has the ability to be consistently objective about students' performance and, at the same time, can make performance results readily accessible to teachers (Kamil, 1987). Weber & Henderson (1989) found CBRI to lead to more efficient reading, thereby facilitating the development of higher-level thinking skills (Tzung-yu, 1993).

In regards to the fear of CBRI detracting opportunities for social interaction, Genishi, McCollum, and Strand (1985) demonstrated that this was not the case. Depending on the classroom management style, interactions and communication are facilitated. Students can become highly sociable with the teacher, each other, and even the computer itself as they ask and answer questions, explain procedures and activities, and problem-solve.

Many of the above advantages are referred to and thus further explained in an examination of additional studies of CBRI efficacy. Several studies have focused particularly on the efficacy of using CBRI as a tool for developing literacy skills in emerging readers and found the results to be propitious.

Wise and Olsen (1994) examined how one unique feature of the computer, a speech synthesizer, influenced reading disabled students' progress. In this study, the computer took on the role of tutor as the synthesizer gave it the ability to "talk." Through the use of the synthesizer, students were able to have unknown words identified and spoken for them through the computer. In a sense, much like having someone sitting next to them providing help when needed.

The speech synthesizer benefitted the students in three ways: 1) with phonologically decoding difficult words; 2) with comprehension; and 3) with automatic word recognition. The way the words were identified heightened phonological awareness, and having difficult words identified for students resulted in greater construction of meaning. Being able to repeatedly select unknown words allowed students the opportunity to see and hear the same words in a variety of contexts, which ultimately led to automaticity of word recognition. As a result of using the speech synthesizer on a consistent basis, these students' decoding and automaticity improved as compared to students experiencing traditional instruction.

Similar results were obtained from a study conducted by Miller, Blackstock, and Miller (1994) involving 4 eight-year-old students' repeated use of CD-ROM electronic books. The students were found to make fewer requests from the computer for the pronunciations of words during successive sessions with an electronic storybook, suggesting the acquisition of those words as automatic sight words.

Computer-based reading was also found to be highly beneficial by McConkie and Zola (1987) as student independence increased during reading times because of a speech synthesizer that was used. The ability to be independent motivated students to read more often as they were less frustrated with the act, hence they practiced reading on a more consistent basis.

In a related study by McKenna and Watkins (1995), CBRI was found to aid beginning readers in reading a wider range of texts as access to the speech synthesizer provided an electronic scaffold in which they could read texts that normally would have been at a frustrational level for them. This study went on to show that electronic books positively affect the decoding development of beginning readers, as long as the students already have some decoding ability. This condition supports the contention that in order for the results of CBRI to be favorable, computers should be seen as a supplement to existing reading instruction (Balajthy, 1996a), and not become the total instructional program.

The results of literal interaction with a text were also investigated by Reinking (1988). Computer technology allowed him to develop a software program that enhanced the metacognitive and comprehension skills of readers as they were able to prompt the computer for clarification or simplification of information while reading difficult text. At any point while reading, the student could build comprehension of the text by referring to a built-in, on-line dictionary, reading a simpler version of the text, accessing an animated graphic of a concept, or reading a summary of the main ideas. Students using this specially designed software were found to have improved comprehension skills and fix-up strategies.

Reitsma (1988) experimented with the theory that learning to read is dependent on the opportunities provided to practice doing it. He found equal improvement in beginning readers' accuracy when they experienced CBRI that allowed for speech synthesizer identification and when they participated in guided reading with a teacher or tutor. The CBRI resulted in higher accuracy rates than when the children were reading independently or reading while listening to a tape as means of practicing reading.

Torgesen (1986) indicated the necessity of developing fluency as a prerequisite for developing the higher level skill of comprehension. He contended that computers provided an appropriate arena for students with reading disabilities to practice word identification and increase fluency because CBRI is able "to deliver motivating, carefully monitored, individualized, and speed-oriented practice in concentrations far beyond those available in traditional instructional formats" (p. 159).

As of 1986, Torgesen's hypothesis was simply that. He had not tried to prove his theory that computers could be used to increase reading fluency. But in 1987, Jones, Torgesen, and Sexton tested the theory on a group of reading disabled students through the use of a specially-developed computer program. The group of students exposed to the CBRI did improve their speed and accuracy of word identification, both in and out of context, which in turn positively affected their fluency.

Factors that Influence the Effectiveness of CBRI

Despite the few cases cited earlier pertaining to the inadequacies of CBRI on reading development, the meta-analyses conducted by Darter and Phelps (1990) and Balajthy (1989) found CBRI to be very effective overall and "...did indeed make a contribution to the learning of each particular age or ability group" (Darter & Phelps, 1990, p. 21). In Balajthy's words, "There is no doubt at all that computer-based instruction is more effective than other methods" (1989, p. 70). The advantages appear to outweigh the disadvantages.

Nevertheless, the "Effectiveness of instructional methodology is dependent on a wide variety of factors, such as...the nature of materials used and the criterial tasks by which effectiveness is measured" (Balajthy, 1989, p. 72). How the computer is used is important, beginning with the software that is chosen. Reading instruction can be affected dramatically by CBRI if current research and theory are carefully considered (Robinson, 1990). The purposes of this study address the aforementioned factors addressed by Balajthy. First, it will determine the criteria of effective CBRI as it applies to the Interactive model of reading, and then it will examine the materials used, specifically the software, in order to determine those that are effective.

For many years, concern has been expressed regarding the quality of software available to educators for supplementing reading instruction (Balajthy, 1995; Doyle, 1988; Isaak & Joseph, 1989; Reinking, 1989). The software has been criticized for being an "electronic workbook" (Doyle, 1988), not meeting instructional needs nor matching the curriculum (Isaak and Joseph, 1989), reflecting "misconceptions about the reading process" (Reinking, 1989, p. 27), and potentially maintaining entertainment levels that exceed, and hence distract from, the educational value (Balajthy, 1995).

It is interesting to note that many of the studies investigating the effectiveness of CBRI (see McKenna & Watkins, 1995; Reinking, 1988; Jones, Torgesen, & Sexton, 1987; Reitsma, 1988) utilized software that was specifically prepared by the researchers for the study, as opposed to commercially available software. In all such cases, the special software was designed with the specific educational needs of the study in mind, for example Reinking's (1988) inquiry as to how CBRI can affect comprehension. This fact, coupled with educators' concerns about the software that is available, leads to the question of how effective commercially available software is. A study investigating the effectiveness of CBRI should be able to use commercially available software since that is what most educators would be utilizing in classroom instruction.

Deficient Areas in CBRI Literature

CBRI does have its limitations, and just because a task is performed on the computer does not guarantee success. Given the volume of software available for supplementing reading instruction, the conflicting results of the effectiveness of CBRI, the time needed and cost involved for implementing CBRI, and the expression of concern over the quality of available software, software must be examined in order for computer-based reading instruction to be most effective.

Based on the research studies and meta-analyses reviewed above, it appears that certain qualities influence the effectiveness of software. Some studies (see Reinking, 1988; McKenna & Watkins, 1995) reported significant, positive results in the effectiveness of computer-use as a supplement to traditional reading instruction. Since these studies utilized specially developed software, it can be concluded that certain characteristics of the software may have affected the outcomes of those studies. Current research has seemingly not comprehensively explored which characteristics of software are most effective in supplementing the reading instruction the majority of children are receiving today- the Interactive model.

Many journals and magazines do offer reviews of software that is available for supplementing instruction. Frequently, these reviews are written by computer experts, as opposed to education and reading experts, resulting in reviews that are often primarily technical in nature. Sometimes, a general rating is assigned to the overall package, for example an A-. Such reviews focus on hardware requirements, a brief description of the program, cost, and how effectively the software runs on the computer.

While it is recognized that this is pertinent information, equally important is the educational value of the software based on currently applied theories of learning and reading instruction (Miller & Burnett, 1986; Robinson, 1990)- an aspect frequently ignored in reviews. For educational purposes, these reviews do not supply enough information. Additionally, grades assigned to a package by the reviewer are usually inflated; "any grade under a B is rare" (Miller & Burnett, 1986, p. 159). Therefore, such reviews may not be representative of a package's true potential worth.

Common sense suggests that classroom teachers, reading specialists, and reading instruction educators, who are experts on the curriculum and educationally sound practices and who know how reading instruction is approached with their students, are the most capable judges of software's educational value. However, often they do not have the time nor the ability to review and purchase the software that will be used in their instruction (Robinson, 1990).

In such cases, reviews found in professional journals and magazines may be somewhat useful. Unfortunately, this, too, can be time-consuming as the software reviewed in each particular resource may include only one or even zero titles specific to reading, resulting in the need to do a great deal of research to even locate the reviews. Then there is always the possibility that if reviews of reading software are located, the software is appropriate for a different grade level or instructional approach, or it received a less than impressive review. Comprehensive reviews of all the software pertaining to a specific approach to reading at a specific grade level were seemingly unavailable. As an aid to educators, this study offers a review of numerous software titles, including many different types of software, from a variety of publishers.

Evaluation devices. For the software review process, there is a multitude of evaluation devices available, often in the form of a checklist (see Doll, 1987; Mojkowski, 1983; Sloane, Gordon, & Gunn, 1989). It has been a pattern in most evaluation devices to focus mainly on "non-learning issues" (Miller & Burnett, 1986). For the purposes of this study, existing evaluation devices were rejected because they were typically technically oriented, too general or broad in their focus, and/or too lengthy to be a valuable tool to a classroom teacher.

For example, many checklists were seemingly constructed with the intention of reviewing any software package (math, science, social studies, etc.) intended for any age level, thus resulting in a device that thoroughly measured technical aspects but did not focus specifically on the elements of quality reading instruction for the first and second grade levels (see Doll, 1987; Sloane, Gordon, Gunn, & Mickelsen, 1989). The results were criteria that focused "...on technical and superficial features at the expense of educational concerns" (McDougall & Squires, 1995).

Those evaluations that were specific to software intended for reading instruction were limited in scope and consisted of criteria that were broad even within the realm of reading instruction because they were not specific to a particular learning level (Scott & Barker, 1987; Holznagel, 1983). The learning outcomes for beginning readers will be very different than those for intermediate readers. Therefore, the criteria on the evaluations should reflect specific expectations.

This study will also aid educators by utilizing and supplying an evaluation device that is geared toward the reading instruction of first and second graders who are learning in a classroom that subscribes to the Interactive model of reading. Use of this specially designed checklist will help to identify software that is appropriate for inclusion in this particular type of reading program. Futuristically, educators will be able to use the simple form when they are faced with the task of reviewing software that may be published subsequently or that was not included in this study.

With the knowledge of the potential effectiveness of CBRI, the permanence of computers in our society, the plethora of software, both quality and inferior, that is available for reading instruction, and the lack of an evaluation device that is designed to meet the specific needs of beginning readers in the 1990s, educators should welcome the results of this study. Valuable time and money can be saved for software that is appropriate and worthwhile for implementation into a reading program.

METHODOLOGY

Research has shown that CBRI can be effective in developing reading skills when used as a supplement to reading instruction (Balajthy, 1987). However, it appears that certain characteristics of software provide more effective results than others (see Reinking, 1988; McKenna & Watkins, 1995). Based on a review and analysis of the literature, it has been concluded that CBRI can be effective, but that its effectiveness appears to rest on the qualities evident in the software. Building on research that has been conducted in the past, this study asks 1) What characteristics should be present in computer software intended for use by first and second graders in order for the CBRI to be effective and congruent with classroom approaches? and 2) According to these characteristics, which of the software titles available today can be recommended as effective supplements to existing reading instruction?

The scope of this study is limited to reading instruction at the first and second grade levels, in which most students are in the emerging stage of reading (Barr, Blachowicz, & Wogman-Sadow, 1995). In a classroom that subscribes to the Interactive model of reading instruction, students' initial experiences with reading instruction include developing primarily print skills that will help them translate authentic texts into meaning. At this stage, students often require a great deal of teacher support in order for the skills to be mastered.

Computers, with their advancing technological capabilities, are becoming more able to effectively assist with this initial stage of learning how to read by providing some of that support. Effective software will utilize the unique features the computer has to offer, reflect exemplar methods of reading instruction, and attend to those areas of reading instruction that cause difficulties for students (Wilkinson, 1983).

Overview of Design of Study

Determining the specific characteristics of each of Wilkinson's (1983) criteria as they pertain to reading instruction at the first and second grade levels was achieved by conducting the study in four stages. Stage 1 entailed distributing surveys to public school educators and experts in the field of computer-based reading instruction in order to ascertain what they seek and value in the software that is used in their classrooms. The survey also assessed educators' attitudes toward the quality and usefulness of available software, and requested titles of software deemed to be worthwhile. This first stage was necessary as a way to discover and directly relate the study to what is being practiced and experienced in the schools. Inclusion of Stage 1 ensured that the information gleaned from this study would be more accurate and useful in authentic classroom settings.

Stage 2 involved the selection of software included in the study. A variety of sources were used in locating titles of software that showed potential, including recommendations by school educators and experts in the field as well as an analysis by the researcher of the available software. Details on how software was chosen for inclusion in the study is outlined in a later section. However, in most cases, software was obtained for review directly from the publishing companies. Selecting the software for the study was a crucial stage given the vast quantity of software available.

It would be an unrealistic goal to attempt to review all appropriate titles available on the market. However, efforts were made to review a moderate sampling of the software that was readily available, and/or seemingly well-known, to the educational field. It is not the intent of this study to suggest which titles are best-known and which companies market their product successfully. The exclusion of titles from this study was not necessarily an implication of their being unknown to the educational world.

Stage 3 involved the design of a software evaluation device which could distinguish what characteristics should be evident in effective software. This evaluation tool can be used by school personnel when reviewing and identifying effective software.

Stage 4 entailed the actual review and analysis of the software and addressed the study's second question resulting in recommended titles which are congruent with current understandings of reading instruction. Therefore, the outcomes of the study are two-fold: 1) the development of a field-tested evaluation device which can rate the degree of congruence a software program has when used as a supplement to an Interactive reading program; and 2) the identification of quality software that is recommended for use in first and second grade classrooms. Figure 1 describes the stages of the study including the components involved in each.

Stage 1	**Stage 2**	**Stage 3**	**Stage 4**
Survey Distribution • To educators and experts in the field Determine: • Effective characteristics of currently-used software • Desirable characteristics of software considered for purchase • Educators' level of satisfaction in available software • Suggested titles of software	Software Selection • Sources consulted • Criteria for selection • Titles selected for review	Evaluation Device • Development and reliability check of criteria as they relate to the Interactive model of reading instruction • Development of criteria into evaluation device	Software Review and Analysis • Field test evaluation device • Review by undergraduate students • Review by researcher • Review by graduate students • Field-test software with first and second grade students • Analysis of review results

Figure 1. The stages of the study and their components.

Procedures for Data Collection and Analysis

Stage 1- Survey Distribution

The first stage of this study involved gathering information from those who are directly involved in using CBRI with first and second graders. This was accomplished through use of a written survey. The primary goals of the survey were to determine 1) which characteristics educators deem to be essential in the software that they currently use in their classrooms, 2) which characteristics educators desire in the software that they would consider purchasing for use in their classrooms, and 3) educators' level of satisfaction with software currently available from publishing companies.

Participants

The survey was mailed to 61 randomly-selected Connecticut public elementary schools and 14 experts in the field of CBRI, resulting in the distribution of 75 surveys. Of the 61 Connecticut public elementary schools that were sent surveys, 17 individuals from 16 schools returned the surveys to become participants, resulting in a response rate of 28%. Respondents consisted of 2 males, 10 females, and 5 anonymous individuals. For the purposes of this study, and based on State of Connecticut requirements for teachers, it is assumed that each of these participants hold, at the minimum, a bachelor's degree in elementary education and an Initial Educator teaching certificate. Due to the random distribution of the survey, the age, race, religion, and ethnicity of the survey participants is unknown.

The survey was also sent to 14 individuals considered to be experts in the field of

CBRI because of their association with committees specific to CBRI and/or their involvement and achievement in the field through research and publication. Of these 14 individuals, three returned the survey, one male and two females, resulting in a 21% response rate. Each of the expert respondents hold a doctorate degree in Reading. Once again, the age, race, religion, and ethnicity of each participant is unknown.

Educators teaching in the elementary schools received a survey packet that included a cover letter addressed personally to either the school's assistant principal, curriculum specialist, or the principal. The letter briefly described the study and asked that individual to forward the survey to the educators in the school who would have the most knowledge and interest in the area of CBRI (see Appendix A). An additional letter intended for the individual who would be completing the survey accompanied the packet that described the study and survey in more detail (see Appendix B). Experts in the field were sent a slightly different letter accompanying the survey that also briefly described the study (see Appendix C).

Survey Design

In order to encourage educators' participation in the survey, the survey itself was designed to be brief, clear, and easy to fill out. Individuals were instructed that their responses would remain anonymous in order to encourage security, honesty and thoroughness in their replies. Each survey was accompanied by a self-addressed stamped envelope for ease of return; participants were requested to respond by a given date, approximately three weeks after the surveys were mailed. In exchange for taking part in the survey, participants were offered to have the results of the study mailed to them, including the evaluation device and the list of computer software found to be effective, upon completion of the study.

Through five questions, the survey asked for information pertaining to the educators' level of satisfaction with available software, desirable characteristics of software intended for use in their classrooms, and titles of software they have had success with (see Appendix D). Levels of satisfaction were indicated based on a scale of one to four, four indicating high satisfaction and one indicating low, if any, satisfaction. Other items generated information through written, short answer responses by the individuals; to foster open-ended responses, no examples, suggested categories, or characteristics were supplied.

Information gleaned from the item pertaining to software titles on the survey was used to influence and direct the search and selection of software to be included in the study. Characteristics of effective software indicated by those surveyed was compiled and referred to in the creation of the evaluation device used for the actual review. The items pertaining to level of satisfaction were used to support recommendations and conclusions resulting from the study.

Stage 2 - Software Selection

Selecting which software would be included in the review was a significant and complex process, given that there are over 1000 titles currently available that are specific to reading (Balajthy, 1996b). In order for the information gleaned from this study to be most useful to educators, a comprehensive search of several sources was conducted. It was important that the review include titles that are well-known to and widely-used by educators as well as titles that may not be as familiar to them.

Sources Consulted

Several sources were consulted in pursuit of titles of software that had the potential for being included in the review. Sources used included 1) professional journals and magazines that provided reviews of software or articles suggesting uses of the software, 2) elementary- and college-level educators through the previously mentioned survey that was distributed, 3) other educators and experts in the field at state and international reading conferences, 4) clearinghouse catalogs, which provide brief descriptions of software, including the level(s) it is appropriate for and its function, and 5) catalogs distributed by software publishing companies.

This combination of direction from colleagues, experts, professional publications, and publishers provided a well-rounded sampling of the products that are available to educators. It also was an indicator of which titles and publishing companies have become well-known to educators and which ones remain unfamiliar or unused. Many of the titles, such as those from the survey and journal articles, were recommended based on actual classroom experiences with the software.

Criteria for Selection

Due to the large, and growing, amount of reading software available, informal criteria were established that directed the selection process. Software selected for participation in this study appeared to exhibit the following qualities:

1. appropriate contents for grades 1 and/or 2

2. an objective of developing print skills
3. use of techniques that are congruent with the Interactive model of reading
4. utilization of the unique features of the computer
5. motivational qualities to first and/or second graders
6. availability in a Macintosh version

Titles selected

A comprehensive search resulted in the selection of 83 titles, representing 40 publishing companies, that appeared to have, based on their description, most or all of the above qualities. See Appendix E for a list of the titles of software selected for invitation to be part of the study. Although the value of making the reading/writing connection in emerging readers is fully recognized, software whose main function was known to be word processing was not included in the selection process.

Once the software was selected, the publishing companies were invited to have their software included in the study. Through a written invitation, the purpose of the study was explained and a complementary review copy of specific titles was requested for review and evaluation (see Appendix F). The letter also informed publishers of the intent to publish and present the results of the study, an incentive to have their software be a part of the study. Additionally, the publishing companies were encouraged to contribute any other software they considered to be applicable to the study.

Of the 83 titles selected for and invited to participate in the study, 13 publishing companies responded and supplied a total of 29 titles. Eight of those titles received were not requested by name, but were sent by the choice of the publishing company for inclusion. See Appendix G for a list of the titles that were contributed by the publishing companies.

Two companies formally declined the invitation because of a company policy not to supply complementary copies of their software. No reply to the invitation was received by the remaining 25 publishing companies, representing 47 titles. Several of the publishing companies who participated expressed an interest in receiving the results of the study in its entirety upon completion.

In addition to the 29 complementary copies of software that were received from the publishing companies, nine titles were requested on a preview basis from either a software clearinghouse or publishing company. Many clearinghouses will offer schools the opportunity to preview software for a limited time (usually 30-45 days) with no obligation to purchase the software. These were titles that were either not available from the publishing company for complementary review or resulted in no reply, but were of particular interest due to the qualities they seemed to exhibit or because of a recommendation. Eight of those titles were either not received before the specified due date or were unavailable for preview, and thus were not available to reviewers during the review process. See Appendix H for a list of the software titles requested for preview.

Overall, there were a total of 30 software titles included in the software review from 14 publishing companies. This sampling represents a variety of what is currently available, including products from both large and small publishing companies, programs on floppy disks and CD-ROM, tutorial, tool, simulation, and electronic book formats, narrative and expository texts, and activities for a range of ability levels. Table 1 represents a complete list of all of the software titles obtained for use in the review process and the publishers.

Table 1

Titles of Software Reviewed in Study

Publisher	Title
Davidson & Associates	1. Davidson's Kid Phonics
Discis Knowledge Research, Inc.	2. Butterflies
	3. What Air Can Do
	4. Cinderella
	5. The Paper Bag Princess
	6. Discis Fun House- Play to Learn Series
Disney Interactive	7. Winnie the Pooh and the Honey Tree
	8. Lion King
	9. Pocahontas
Dorling Kindersly	10. My First Incredible, Amazing Dictionary
	11. The Way Things Work
	12. P. B. Bear's Birthday Party
Edmark	13. Imagination Express Series Destination: Ocean
	14. Imagination Express Series Destination: Rainforest
	15. Baily's Bookhouse
Entrex Software, Inc.	16. Sugar & Snails and Kitty Cat Tails (demo copy)
The Learning Co.	17. Interactive Reading Journey
	18. Reader Rabbit 3
MECC	19. Word Munchers
	20. Big Anthony
	21. Storybook Weaver
Mind Play	22. Jo-Jo's Reading River
Orange Cherry/ New Media Schoolhouse	23. The Wind in the Willows
Soleil Software	24. Zurk's Learning Safari
	25. Zurk's Rainforest Lab
Teacher Support Software	26. Make-A-Book
	27. Reading Realities
Tom Snyder Productions	28. Jack & the Beanstalk
Virgin Sound and Vision	29. Get Ready for School, Charlie Brown
	30. Wiggins in Storyland

Stage 3 - Evaluation Device

In order to determine the effectiveness of this software in supplementing a first and/or second grade Interactive reading program, characteristics of such a program were used in developing a checklist for evaluating the software. A comprehensive search for an existing evaluation device with which to review specifically reading software revealed a need for such a device.

It appeared that previously developed checklists tend to be general in nature in that they are applicable to most, if not all, types of software and developmental levels (see Doll, 1987; Scott and Barker, 1987; Sloane, Gordon, Gunn, & Mickelsen, 1989). As a result, they have the tendency to focus primarily on the technical aspects of the software, for example ease of operation and display of text, as opposed to the educational value.

While the importance of a software package being technically competent is recognized by and illustrated in this study, it seems that the educational value may have been ignored on evaluation devices in the past. This could be due to the fact that, historically, it has been understood that the teaching and learning context that the software will be used in varies from classroom to classroom (Mojkowsky, 1983). Thus, the effectiveness of software will vary from one context to the next. This study, however, defines a specific context in which the software will be used, classrooms utilizing an Interactive model of reading, and therefore warrants designating distinct educational outcomes.

Preliminary Evaluation Device Design

Due to the absence of an appropriate evaluation device for determining which software titles could be labelled effective, an evaluation device consisting of educationally sound criteria was developed. The criteria to be included in the evaluation device were derived primarily from 1) responses given by educators to items on the surveys pertaining to desirable characteristics of software and 2) from what research reveals about sound reading instruction (see Vacca, Vacca, & Gove, 1995).

The survey responses and research information were first consolidated and formulated into statements that were considered as potential criteria to be included in the evaluation device, and then organized into a preliminary form in order to conduct a reliability check (see Appendix I). It was originally proposed that the software would be rated on an attitudinal scale from strongly agree to strongly disagree for each criterion on the checklist.

The criteria on the preliminary form were organized into four categories, Format, Content, Skills Addressed, and Activities. Criteria in the Format category pertained to the organization and presentation of the software as well as to selected technical characteristics. The Content section contained elements specific to how the software relates to first and second graders. The Skills Addressed section was subdivided into the specific skills of concepts of print, print skills, and comprehension. The Activities section addressed how the students use the software.

This preliminary form of the evaluation device, containing 62 criteria, was distributed to experts in reading instruction at a local university for the purpose of determining the reliability of the criteria. The form was accompanied by a cover letter, which briefly explained the study and asked for assistance evaluating the wording of the criteria (see Appendix J). These experts were instructed to describe each statement as being 1) clear in its intended meaning, 2) too specific, 3) too broad, 4) subject to interpretation, or 5) needing further explanation.

Checklist Design

As a result of the feedback and reference to established software evaluations (see Doll, 1987; Sloane, Gordon, Gunn, & Mickelsen, 1989), the evaluation device was organized in the form of a checklist as opposed to the originally proposed rating scale. This was due to the fact that the way in which the statements are worded describes a concept that is either present or not present in the software as opposed to a reactive response (agree, disagree). Thus, criteria were formulated to be checked as either applicable or not applicable to the software package being reviewed. The construction of the preliminary form into an evaluation device included reducing the number of criteria from the original 62 items to 43 items. The "Activities" section of the preliminary form was eliminated due to the fact that those criteria either already were or could be embedded in the other sections. For the purpose of the software review conducted in this study, three of the four phases of review utilized the revised draft, Form 1, of the checklist (see Appendix K).

Stage 4 - Software Review and Analysis

The software review process involved three phases of review and evaluation and three analysis procedures (see Figure 2). The three phases of the review were conducted

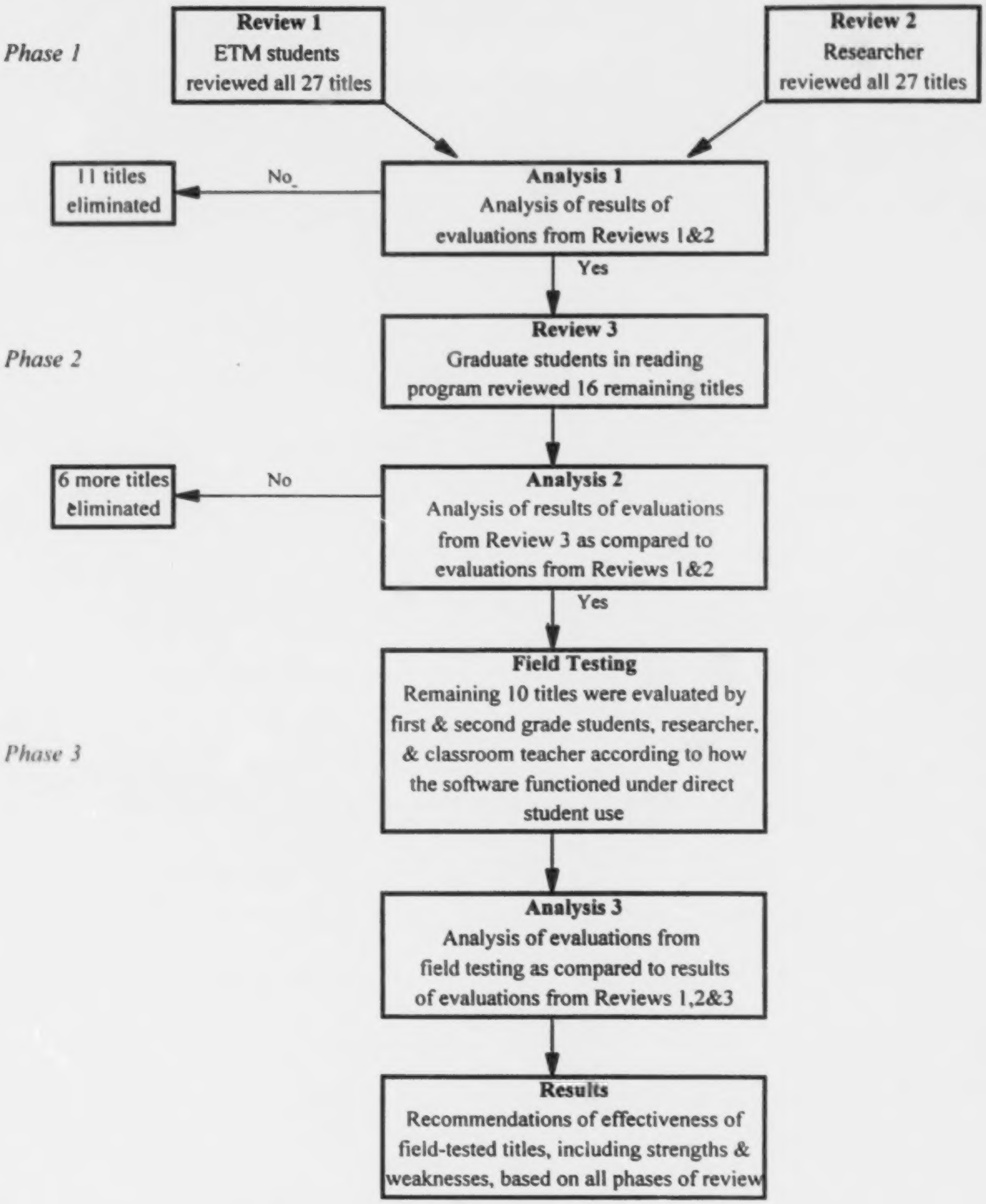

Phase 1
Review 1
ETM students reviewed all 27 titles
Review 2
Researcher reviewed all 27 titles
11 titles eliminated
No
Analysis 1
Analysis of results of evaluations from Reviews 1&2
Yes
Phase 2
Review 3
Graduate students in reading program reviewed 16 remaining titles
6 more titles eliminated
No
Analysis 2
Analysis of results of evaluations from Review 3 as compared to evaluations from Reviews 1&2
Yes
Phase 3
Field Testing
Remaining 10 titles were evaluated by first & second grade students, researcher, & classroom teacher according to how the software functioned under direct student use
Analysis 3
Analysis of evaluations from field testing as compared to results of evaluations from Reviews 1,2&3
Results
Recommendations of effectiveness of field-tested titles, including strengths & weaknesses, based on all phases of review

Figure 2. The steps involved in the software review process.

in either a research laboratory or an actual classroom setting by several groups of individuals, including elementary students and educators with ranging experience, background, and ability in teaching reading. The purpose of the review process was two-fold. The first purpose was to identify which titles were effective according to the evaluation criteria for supplementing Interactive reading instruction of first and second graders. The second purpose was to validate and refine the evaluation device.

Each phase of review was followed by an analysis of the results of the evaluations. The three analyses were conducted by the researcher and resulted in several titles being eliminated from the review process at the end of each phase. Eliminations were made due to evidence that they lacked congruence with the Interactive model of reading instruction according to the evaluation device. Figure 3 illustrates this elimination process as a result of the phases of review and the analyses that followed each phase.

Phase 1

The first phase involved two separate reviews, one conducted by undergraduate students under the guidance of the researcher and the other conducted by the researcher.

Review 1. The undergraduate students, the participants in Review 1, were sophomores and juniors from two Educational Technology Media (ETM) classes (n=26) at a local university who were enrolled in a teacher education program. All of the students had completed an introductory course in reading instruction. Many of the students also had completed a second extension course in integrated Language Arts.

The ETM 200 students were chosen to participate in Phase 1 of the software

Phase 1

100% of available titles evaluated (n=27)

- Review 1- undergraduate ETM students
- Review 2 - researcher
- Analysis 1 - 11 titles eliminated

Phase 2

59% of available titles evaluated (n=16)

- Review 3 - graduate students in reading
- Analysis 2 - 6 titles eliminated

Phase 3

37% of available titles evaluated (n=10)

- Field testing - first and second graders, classroom teachers, researcher
- Analysis 3 - recommendations for remaining ten titles

Figure 3. Software titles were eliminated from further review as a result of the analyses of the evaluations, which were conducted during Phases 1 and 2 of the review process. The remaining titles continued on to Phase 3, the field testing component of the software review. Analysis 3 resulted in recommendations for each title that was field tested, based on observations and reactions from the students and their teachers.

review because of their knowledge of operating a Macintosh computer, familiarity through course work with reviewing software, and basic knowledge of reading instruction. Participation in this software review constituted the culminating activity of their course work in ETM 200, and was conducted during their final class session.

Review session 1 lasted approximately one hour in a Macintosh computer laboratory used for the instruction of college students at the university. The Mac lab consisted of 12 computer stations, 10 of which were equipped with the necessary system requirements. The majority of the software was in the form of CD-ROM, and required System 7.0 or higher, a 256-color monitor, a double-speed CD-ROM drive, a mouse, and up to 8Mb of RAM.

Since there were more than ten reviewers in each class session, some of the reviewers were required to work in pairs at one station. In the first class session, there were four pairs of reviewers and three working independently. The second class session consisted of five pairs and five independents. Phase 1 reviewers that were working in pairs were allowed to discuss the software but were instructed to complete separate evaluations.

The first ten minutes of each session was used to give the reviewers a brief background summary of the study, establish the purpose of the review session, which was to refine the evaluation device and evaluate the software, and to provide instructions for how to complete the review, install and boot up the software, and use the evaluation device. Reviewers were to assess the software based on the assumption that first and second grade students would receive instruction from their teacher on how to use the software prior to using it independently.

The thirty software packages were laid out on a table in order for the reviewers to select the titles they would use for the review. The stated goal was for each reviewer to review two packages, allowing for approximately twenty-five minutes with each title. This guideline was established as a premise for a realistic amount of time that a teacher may use to review a program when considering it for use in his/her classroom. However, not all reviewers were able to review two titles due to operational difficulties and complexities.

With each software package review, reviewers were instructed to spend the first five minutes initially perusing the manual (if available) and exploring the software without evaluating it, for the purpose of acclimating themselves with the software and getting a feel for how it ran and what its educational objectives were. Experiencing the software more than once was important as initial reactions were not always accurate.

Next the reviewers were told to reboot the program and evaluate the software according to the criteria in the evaluation checklist, Form 1 (see Appendix K). The reviewers were asked to use the evaluation device to decide, based on their experience, if the software package they were using was one they thought would be appropriate for and useful as a supplement to the reading instruction of first and second graders. Acute reviews were encouraged.

Reviewers were permitted and encouraged to ask for assistance from the researcher and/or course instructor or to refer to the software's manual for guidance in operating the software and discovering its capabilities. Comments about the checklist were valued; reviewers were prompted to bring to the researcher's attention any criteria and wording found to be confusing and to ask for any necessary clarification regarding items of the evaluation device.

Discourse between the researcher and reviewers was limited to answering questions about the evaluation device and operating the software so as not to influence the reviewers' evaluations of the software. A record of questions and concerns regarding the evaluation device was kept in order to use the information in revising the checklist.

During Review 1, it was discovered that two of the software packages sent by the publishing companies were IBM versions, and therefore were unable to be included in the study. Additionally, one title was found to have technical difficulties as it repeatedly crashed upon being booted up, and consequently could not be reviewed. The total number of software titles evaluated in Review 1 was twenty-seven. Between the two ETM 200 classes, all of the software was reviewed by at least two students.

Review 2. Review 2 consisted of the review and evaluation of the twenty-seven software titles solely by the researcher in the Mac lab at the university. The same review procedure was followed in which the software was used freely for the first five minutes for acclimation purposes before evaluation, and then scrutinized under the guidance of the checklist. When possible, a thirty minute time limit with each package was maintained, however some required additional time for operational purposes. Form 1 of the checklist was used, and a record was kept of any problems associated with the evaluation device that were discovered under use.

Analysis 1. Upon completion of Reviews 1 and 2, the results of the evaluations were examined and analyzed by the researcher. The undergraduate students' and the researcher's assessments of each software title were compared in order to determine which titles could be eliminated from further review and which would go on to Phase 2.

Refinement of evaluation device. After using Form 1 of the checklist through two review sessions, it became apparent that not all 43 criteria needed to be applicable to software in order for the software to be considered effective. Sixteen of the criteria located in the Skills section pertained to specific skills addressed by the software. These characteristics are more descriptive of material that the software covers than being criteria of effective software. Therefore, all of these skills do not need to be addressed in one software program in order for it to be recommended as effective. Rather, they are useful for a teacher to know what material the software consists of.

Of the 43 criteria on the checklist, 15 were chosen for the purpose of comparing the results of the evaluations from the first two phases (see Appendix L). These 15 were considered to be criteria essential to all software used in a first or second grade reading program. These criteria are congruent with Wilkinson's (1983) in that they use the unique features of the computer, they are characteristics of the Interactive model of reading, and they address those areas of reading that children in first and/or second grade may need to develop.

Selection of software for Phase 2. Through consultations with experts in the field of CBRI, a percentage of 73%, 11 out of the 15 chosen criteria, was established as the amount required to be present in software in order for it to be considered effective. Reutzel (1996) developed a similar evaluation device for reviewing computer software, in which a rating of 87.5% or more is considered an "outstanding" package and 75%-87% is considered "very good." During a telephone consultation, Balajthy suggested the widely-accepted 80% mastery level rating as a minimum for software to be considered effective.

Analysis 1 consisted of comparing and averaging the evaluation results from Reviews 1 and 2. Averaging the scores resulted in four of the 27 titles reviewed to qualify in the 80% and above range; three exhibited an average of 80% and one exhibited an average of 87% of the criteria. Due to the minimal number of qualifying packages, a lower rating of at least 73% was established for the purposes of this study in order to allow for the review of software exhibiting a fair-to-good representation of the desired characteristics.

Titles that were considered qualified to continue in the review process were those that received the established average rating of 73% or above on the 15 criteria in both Reviews 1 and 2 of the review or those whose evaluations from Reviews 1 and 2 contained a discrepancy. A discrepancy was considered to be a difference of at least 13%, or 2 items, in the overall rating between the two evaluating parties (the undergraduate students and the researcher). Of the twenty-seven original titles, eleven were eliminated resulting in sixteen titles qualified to go on to Phase 2.

Phase 2

Review 3. The software titles that qualified to go on to Phase 2 were reviewed a third time by graduate students enrolled in the reading program at the university. These 16 students were certified, female teachers who all held teaching positions at the time of the review. The level of teaching experience of the reviewers ranged from Pre-K to grade

7 and included regular education, special education, and reading teachers. At the time of the review, the students were enrolled in Remedial and Corrective Techniques in Reading, the second course in a three course series for state certification as a Language Arts specialist.

These students were selected for the Phase 2 review because of their dual qualifications of classroom experience and recent expanded knowledge in reading instruction. The review was conducted during a 75 minute portion of the last class session. In exchange for their assistance with reviewing the software, the reviewers were offered the results of the study, including the evaluation device and the list of effective titles, upon completion.

The review took place in the same computer lab that Reviews 1 and 2 were conducted in, utilizing the same ten computer stations and Form 1 of the evaluation device (see Appendix K). No alterations were made to the checklist prior to this review in order to maintain consistency in the evaluations and analysis steps. Using Form 1 again also aided in establishing the validity of the evaluation device. Because there were sixteen students and ten stations, twelve reviewers worked in pairs and four worked independently.

The review procedure followed and directions given were identical to those used in Phase 1, except that this review session lasted approximately 75 minutes as opposed to one hour. The students were given a brief background summary of the study, selected the packages they wanted to review from a table, were instructed in how to install and boot up the programs, and were informed that the purpose of the review was to refine the checklist and to evaluate the software in order to determine which titles are effective.

The students were instructed to spend the first five minutes acclimating themselves with the software before evaluating it. They were encouraged to ask any questions about the operation of the software during use and to share thoughts and questions about the evaluation device. Once again, questions and comments about the device were recorded in writing by the researcher for reference to during the final refinement of the checklist. Discussions between the reviewers and the researcher pertaining to the effectiveness of the software were discouraged, and acute evaluations were promoted. Students were prompted to spend no more than thirty minutes with each program, however some required more time with software that was more complex to operate.

Reviewers that were working in pairs were required to complete only one evaluation checklist in order to achieve one overall assessment of the software for Phase 2 and aid in a triangulated comparison between the three groups of reviewers. As an additional piece of information, all reviewers were asked to indicate at the top of the checklist upon completion of the evaluation whether they would purchase the software based on their experience with it.

Analysis 2. After the completion of Phase 2, the results of the evaluations were examined and compared to the results of Phase 1. For this analysis, the 15 criteria established for Analysis 1 were again used in order to consistently compare the results of all three review phases.

Refinement of evaluation device. After three reviews using Form 1 of the evaluation device, flaws in the design of the checklist became obvious. Following Review 3, additional feedback regarding the evaluation device was received from these experienced classroom teachers via a group discussion. The reviewers and researcher discussed the checklist format of the device (A, N/A) and the possibility of using a 1-4 rating scale instead. The majority of the reviewers, 15/16, preferred the checklist format in order to ease the reviewing and evaluating process, and, therefore, the overall decision-making about the software.

It was suggested and agreed upon that some of the items should be separated from the rest and included in a different section of the checklist as they applied to the skills addressed the software. This would recognize the fact that not all software should address all skills. It was concurred that knowing what skills are addressed by the software is helpful to know but shouldn't be weighed in the rating of a package. Reviewers supported the addition of a separate overall rating of whether to purchase or not purchase the software.

Selection of software for Phase 3. In addition to rating each software program according to the 15 criteria discussed previously, 26 of the 43 criteria (which included the original fifteen) were selected and identified for further comparison purposes (see Appendix M). These 26 criteria provided a more detailed evaluation of the effectiveness of the software and validated the accuracy of the evaluation device. Figure 4 details the criteria items referred to in Phases 1 and 2 when determining the qualifications of each software package.

In some instances in the analyses of the graduate student evaluations, the number

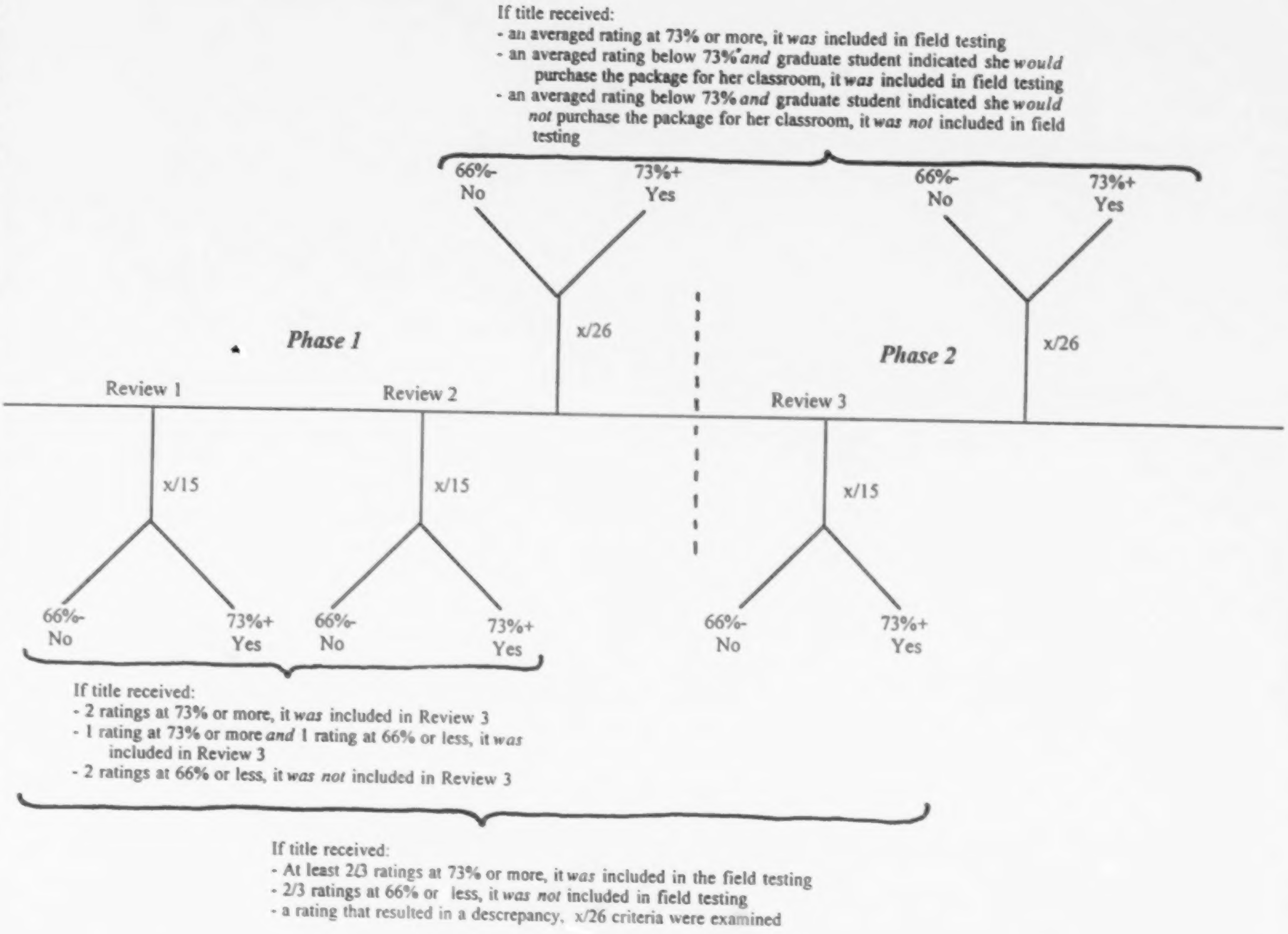
	# of criteria items examined		**% necessary for continuation**	
Analysis 1	15 items (Appendix L)		11/15 = 73% (minimum)	
Analysis 2	15 items (Appendix L)	26 items (Appendix M)	11/15=73% (minimum)	19/26=73% (minimum)

Figure 4. The number of evaluation criteria items used for phase qualification.

of those 26 criteria was reduced on a per evaluation basis. This occurred if there appeared to be a discrepancy or misunderstanding of terms used on the checklist, if the reviewer gave a conditional response, or if it appeared that the reviewer was not fully aware of a package's capabilities due to time restrictions. Disregarding these criteria as a factor in the overall score also contributed to confirming the validity of the evaluation device. As was previously mentioned, the remaining 17 items, which were descriptive of the reading skills addressed by a package, needn't all be present as it is not educationally sound for each software package to address each of these skills.

Once the x/15 ratings from the three reviews were compared and averaged, those that received at least 2/3 review ratings of 73% or more were considered candidates for the Phase 3 review. Those in which 2/3 reviews resulted in ratings less than the established 73% were eliminated from further review. For those titles whose evaluations resulted in a discrepancy (a difference of at least 13% between the three ratings) with an average rating just below 73%, the x/26 criteria from Phases 1 and 2 were referred to in order to gain a more complete rating. Additionally, the response of the graduate student (Review 3) as to whether she would purchase the package for use in her first or second grade classroom was considered. If the x/26 rating average of Phases 1 and 2 was at or above 73%, that title went on to Phase 3. If the x/26 rating average of Phases 1 and 2 was just below 73% but the Phase 2 reviewer indicated she would purchase the package for classroom use, that title went on to Phase 3 (see Figure 5).

Of the 16 titles that were reviewed in Phase 2, 10 titles were considered to have potential as effective software programs and continued to Phase 3 of the review.


66%-
No
73%+
Yes
x/26
66%-
No
73%+
Yes
x/26
Phase 1
Phase 2
Review 1
Review 2
Review 3
x/15
x/15
x/15
66%-
No
73%+
Yes
66%-
No
73%+
Yes
66%-
No
73%+
Yes

If title received:
- an averaged rating at 73% or more, it *was* included in field testing
- an averaged rating below 73% *and* graduate student indicated she *would* purchase the package for her classroom, it *was* included in field testing
- an averaged rating below 73% *and* graduate student indicated she *would not* purchase the package for her classroom, it *was not* included in field testing

If title received:
- 2 ratings at 73% or more, it *was* included in Review 3
- 1 rating at 73% or more *and* 1 rating at 66% or less, it *was* included in Review 3
- 2 ratings at 66% or less, it *was not* included in Review 3

If title received:
- At least 2/3 ratings at 73% or more, it *was* included in the field testing
- 2/3 ratings at 66% or less, it *was not* included in field testing
- a rating that resulted in a descrepancy, x/26 criteria were examined

Figure 5. Qualifications necessary in a software package (based on the evaluation device) in order for it to continue on to the next phase of review.

Phase 3

Field testing. The 10 titles were then taken to a local public elementary school in order to observe their potential effectiveness under the direct use of real first and/or second graders. After having students use the software it was then evaluated by the students, researcher and classroom teacher, based on the students' interaction with the software. These students were selected to be reviewers because of their appropriate age level, past experience with and knowledge of using the Macintosh computer, and representation of a variety of ability levels within their grade.

The student reviewers consisted of one class of 18 second graders, a group of nine children from a first grade class (henceforth labelled 1A) and a group of eight children from a second first grade class (henceforth labelled 1B) for a total of 35 student reviewers. The reviews took place during four class sessions, ranging from 30 to 60 minutes.

The students ranged in age from six years old to eight years old and represented a variety of races and ability levels. Since students were involved in this portion of the study, a proposal for the study was submitted to and approved by the Human Studies Council of the university, and all interactions were accepted as appropriate.

The computer lab, situated in the school's media center, consisted of 12 Macintosh computer stations, 10 of which were equipped with the necessary system requirements to operate the software. The students worked in pairs, or in threes in the case of an odd number of students.

The students were informed that they would be helping in a special project by using some new software and filling out an evaluation of the software after using it. They were directed as a group by the researcher on how to use the software prior to using it, but all students were familiar with using the computer from their prior experience with it in the lab and the classroom. Software was assigned to the various classes based on its format and content (see Table 2).

Table 2

Assignment of Software For Review by Elementary Students

Review sessions	Class	# of students	Length of session	Software Titles
Session 1	1A	9	1 hr.	What Air Can Do Butterflies Cinderella The Paper Bag Princess
Session 2	1B	8	1 hr.	P.B. Bear's Birthday Party Baily's Book House Big Anthony's...
Session 3	2nd gr. 1/2 of class	9	30 min.	My First... Dictionary Get...Charlie Brown Big Anthony's... P.B. Bear's...
	1/2 of 2nd gr.	9	30 min.	(same as above)
Session 4	2nd gr.	18	45 min.	Reading Realities

Session 1 included all four Discis titles due to their identical format and, thus, operating procedures. Titles for sessions 2 and 3 included all CD-ROMs. Given the nature of CD-ROMs, they were used together because of the similarity in operating procedures and limited capability to be booted up and ran on only one computer at a time. Session 4 utilized only the Reading Realities disk because it was designed specifically for second grade, could be booted up onto multiple computer stations, and required step-by-step directions by the researcher to operate the program. Once students got to the actual reading portion where the program was started they were able to proceed through the text at their own pace.

After a demonstration of how to use each program assigned to their class session, the students were grouped into pairs by the classroom teacher and randomly assigned to a station by the researcher. In the cases of Sessions 1, 2, and 3, each station utilized a different software package; students were allowed to use all of the titles, but evaluated only the first one they used. As the students worked, the researcher and classroom teacher observed and assisted as necessary. Students were allowed to interact with the software independently with no mandatory procedure dictated. Notable interactions by and comments from the students during use were recorded by the researcher on an observation form (see Appendix N).

After use, during the last five minutes of the session, students completed an evaluation form where they responded to their experience with the software (see Appendix O). The researcher orally read each item individually on the evaluation to the students, providing further explanation as necessary. The classroom teacher also responded to how the students interacted with the software and gave her reactions to its educational value on an evaluation form (see Appendix P).

Analysis 3. After the completion of Phase 4, a final analysis of the 10 titles reviewed was conducted. This analysis took into consideration 1) the researcher's observation of the students' use of the software 2) the classroom teacher's observations and evaluation of the content of the software and student interaction with the software, and 3) the students' evaluations of and reactions to their experience with the software in conjunction with the results of earlier phases. Field testing the software provided additional information by accentuating the strengths and weaknesses of each when used by real children. Software that appeared to be effective earlier sometimes reflected considerable incompetencies during actual classroom use.

Summary of the Review Process

The review process consisted of a series of reviews in which the software was evaluated by a variety of reviewers in a variety of settings and situations. All 30 software packages were available for Review 1, and those that were compatible (27 titles) were evaluated by at least two different reviewers. The 27 titles were evaluated in Review 2 by the researcher. After these two phases, an analysis of the evaluations resulted in the elimination of eleven titles because both the researcher and the reviewer found them to be incongruent with the Interactive model of reading instruction.

The remaining 16 titles continued on to Phase 2 in order to either resolve a discrepancy in evaluations from Phase 1 or to affirm high ratings from Phase 1. An analysis of the evaluation reviews based on Phases 1 and 2 resulted in the identification of 10 titles that appeared to qualify as effective software. This potential effectiveness was examined in Phase 3 under direct student use, which exemplified the true strengths and weaknesses of each title and assisted in providing specific recommendations of each.

One result of the study is the identification of software packages that can be recommended as potentially effective supplements to the reading instruction of first and/or second grade students. This identification was based on the review of five separate parties- undergraduate students, graduate students/experienced teachers, the researcher, first and/or second grade students, and their classroom teacher. The second result of the study is the development of a field-tested evaluation device that is specific to reading and can be used by educators for identifying software that will be most congruent with existing reading instruction, and therefore an effective supplement.

FINDINGS OF THE STUDY

The original goal of this study was to identify commercially available software packages that can be recommended as effective supplements to the reading instruction of first and second graders who are learning how to read through the Interactive model of reading instruction. In order to accomplish that goal, characteristics of effective software needed to be identified. Therefore, the purposes of this study were 1) to determine which characteristics computer software has (or should have) in order to be considered effective as a supplemental tool in an Interactive reading program at the first and second grade levels, and 2) to determine which computer software packages currently available commercially have potential to be effective and included in a list of recommended titles for use in first and/or second grade reading programs.

The Survey

The data collected through the survey revealed important information about what qualities educators who are directly involved in the reading instruction of first and second graders value in the software they currently use and what qualities they desire in the software they will buy when developing and/or updating their software collection.

An analysis of the returned surveys revealed these characteristics. Table 3, a compilation of responses to items 1 and 3 on the survey (see Appendix D), represents the

Table 3

Characteristics of Effective Software

Desirable qualities cited by educators	Items of agreement	Multiple responses
1. able to be used independently by children	+	**********
2. motivating/maintains student interest	+	********
3. allows children to review skills being taught in class	+	*******
4. word pronunciation provided, spoken clearly	+	*****
5. authentic text (not contrived)	+	**
6. coincides with curriculum	+	*****
7. definitions of unknown words available	+	**
8. encourages writing	+	**
9. highlighted text	+	***
10. interactive	+	****
11. accommodates a variety of reading levels		
12. significant time-on-task in desired skills		
13. allows students to self-correct		
14. appropriate readability/ comprehension level	+	***
15. able to save progress of each child		
16. emphasizes open-ended thinking skills (beyond drill practice)		**
17. compatible to hardware school owns/ Macintosh		**
18. contain components that need strengthening in existing curriculum		
19. available in more than one language		
20. meets specific goal (ie. drill, coordinates with a book)		
21. parallels phonics instruction of basal		
22. utilizes high quality children's literature	+	**
23. reinforces right/wrong answers		
24. cost		

Note. Asterisks in the "multiple responses" column represent the number of educators who indicated that same quality on their surveys; no asterisks designates one response of that quality. Some characteristics, designated with a plus sign, were represented on both lists.

characteristics desired by educators in order for software to be considered valuable. The survey reveals that many educators value software that is motivating, can be used independently by children, and reflects/practices curriculum and teaching strategies that are presented in the classroom. Additionally, educators commonly consider software that offers clear pronunciations of words and activities utilizing authentic text to be worthwhile. Remaining items address issues of using computers for the unique features they have to offer, such as providing interaction and individualizing instruction.

Responses to items 2 and 4 on the survey indicated varying degrees of satisfaction with the quality of software commercially available for supplementing reading programs. Table 4 illustrates the frequency of responses to these items on the survey.

Table 4

Frequency of Responses to Satisfaction Items in Survey.

	Rating			
Survey item	Very satisfied	Somewhat satisfied	Somewhat dissatisfied	Very unsatisfied
Quality of Available Reading Software	2	6	7	0
Quality of software available in schools	1	6	7	0

General comments to these items on the survey included:

1. not enough quality choices available
2. too much phonics-based software that doesn't support present-day instruction
3. software is not educationally challenging (too much read-aloud)
4. software can't be used independently by students
5. incorrect combinations of entertainment value and educational value
6. little available for supplementing reading instruction
7. nature of software limited

Responses to these two items on the survey revealed, for the most part, neither extreme satisfaction nor extreme dissatisfaction with available software, as indicated in Figures 6 and 7. Additional but separate comments from educators regarding the study showed that some schools were involved in active searches for good software while others didn't have access to any in their schools.

The Evaluation Device

The lack of an evaluation device with which to review the software specific to an Interactive model of reading necessitated the design for one. Characteristics of effective software identified in the survey were used in developing the criteria of the evaluation device. Additional criteria represent what is known about sound reading instruction based on research that has been conducted.

One objective of the review process was to refine this checklist so that it may be used by educators in the future when they are making decisions about software for use in their classrooms. Using the evaluation device through the first three phases of the review process by three groups of participants resulted in important findings about the checklist. Flaws in its design became apparent as they related to the wording of the criteria, a criterion not represented that should have been, and an overall rating of the software.

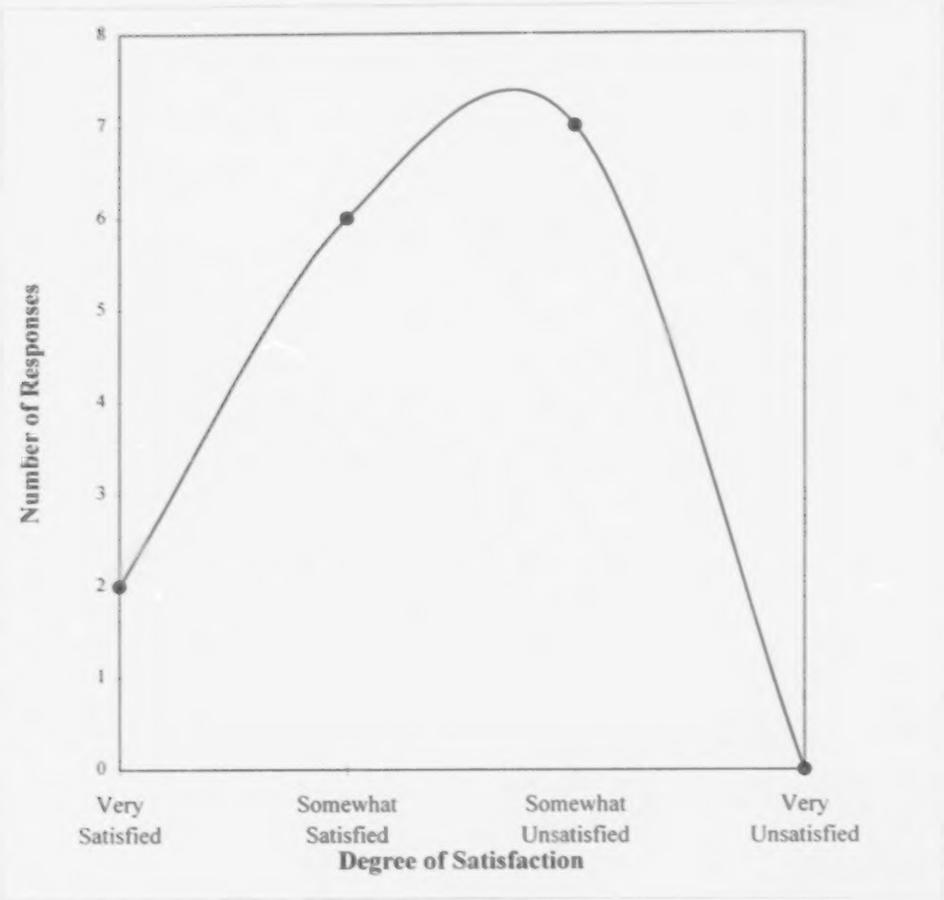


Figure 6. Responses to survey item 2 regarding satisfaction with the quality of reading software available from publishers.

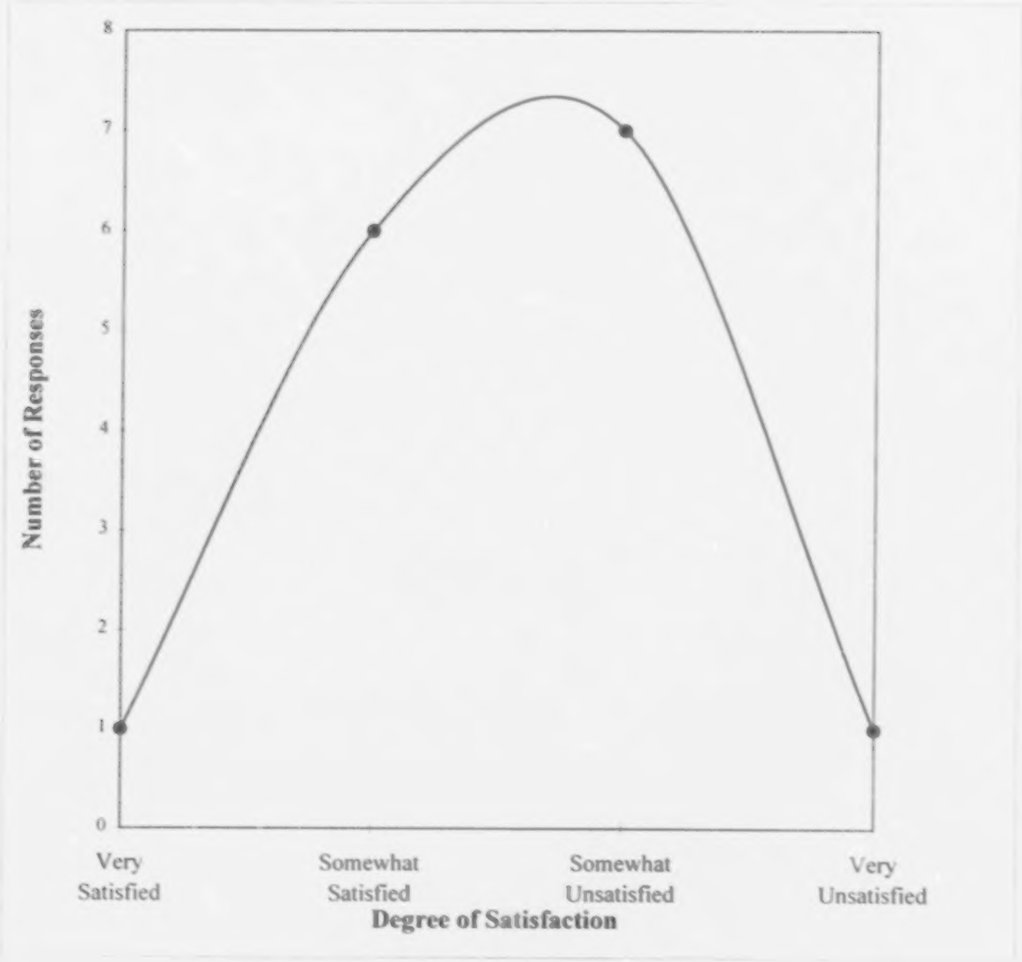


Figure 7. Responses to survey item 4 regarding satisfaction with the quality of reading software available in schools.

Knowledge of this information was imperative for refining the device to a more accurate, usable form.

Table 5 represents the criteria that were inquired about by reviewers during the review, as far as intended meaning or terms used, as well as the comments and concerns about the criteria that were expressed by reviewers. The questions and comments made suggested the necessity of revising these criteria.

In addition to the need for rewording the listed criteria for clarification purposes, it became apparent through reviewing, observing the review process, and discussing the checklist with the graduate student reviewers that an additional criterion would make the evaluation device more complete. Being able to control the speed with which the computer reads the text is important for accommodating different ability levels and providing educational opportunities. Some of the software read at only one pace, which may be too fast or slow, depending on the student. Too fast of a pace may result in passive involvement as the computer does all the "work" while a slow pace may not keep students' attention. Adjusting one criterion in order for it to relate to pace of reading will evaluate this aspect of computer software.

The format of the checklist also appeared to have some potential flaws. Three reviewers in separate review sessions suggested that the scoring system be worded as Observable/ Not Observable as opposed to the Applicable/ Not Applicable system used on Form 1. The rationale was that the characteristics are either seen or not seen in the software during the review as opposed to being able to be applied.

Also, criteria in the Skills section of the evaluation device were discovered to be

Table 5

Criteria Found to be Unclear During Reviews.

Criteria	Comment(s)/Concerns
FORMAT	
1. Engaging presentation (4)	1. ambiguous, from whose point of view?
7. Utilizes quality children's literature	2. meaning of term *utilizes*
12. Entertainment level does not distract from educational value (2)	3. meaning of criteria unclear
CONTENT	
1. Software encourages an *appreciation of text*	1. unclear of phrase appreciation of text (3)
2. Subject/topic is appropriate for and interesting to first and/or second graders	2. suggested to use *or* only
5. Aids in building background knowledge	3. Add *prior to reading*
7. Provides reading opportunities in authentic texts (3)	4. unclear of term *authentic*
PRINT SKILLS	
3. Reinforces decoding using sounds in words	1. unclear of criterion meaning
COMPREHENSION	
3. Presents questions at an appropriate level for first and/or second graders	1. elaborate on meaning
5. Provides opportunities for predicting	2. too open-ended and ambiguous
8. Provides animated graphics that illustrate concept or word	3. clarify that graphics support text and help create meaning

Note. The number in parentheses after some items indicates the number of reviewers, if more than one, that requested further information about that criterion.

misrepresented within the checklist. It was discovered that a software package should not receive a lower score just because it does not address all of the skills represented on the checklist. Although these are skills cumulatively relevant to reading instruction in first and second grade, they represent a variety of levels in reading development, some of which become obsolete as abilities improve. For example, a child reading a text that would be better understood in a simplified test option would most likely be beyond requiring the reinforcement of a left-to-right directionality. Instead of including these as ratable items, it appears to be sensible to create a separate section where the skills addressed receive a check for the educators' benefit of knowing a package's educational opportunities, but don't lower the overall score if they are not present. However, *at least* one (usually more) of the skills should be represented in each software package as those listed are the main skills taught to beginning readers.

An analysis of the criteria evaluated in the 10 finalist packages that went on to Phase 3 of the review (field-testing) revealed that the reviewers from Reviews 2 and 3 (the researcher and graduate students/teachers respectively) were in agreement on which criteria were applicable to each program an average of 71% of the time. Figure 8 shows the percentage of agreement between the two reviews, regarding which criteria each reviewer observed in the software.

This somewhat low correlation can be attributed to a few different factors. The graduate students/teachers occasionally overlooked the real applicability of some criteria that were concrete and not subject to opinion. For example, the criterion that states "provides storage of individual progress" is not a subjective characteristic that reviewers

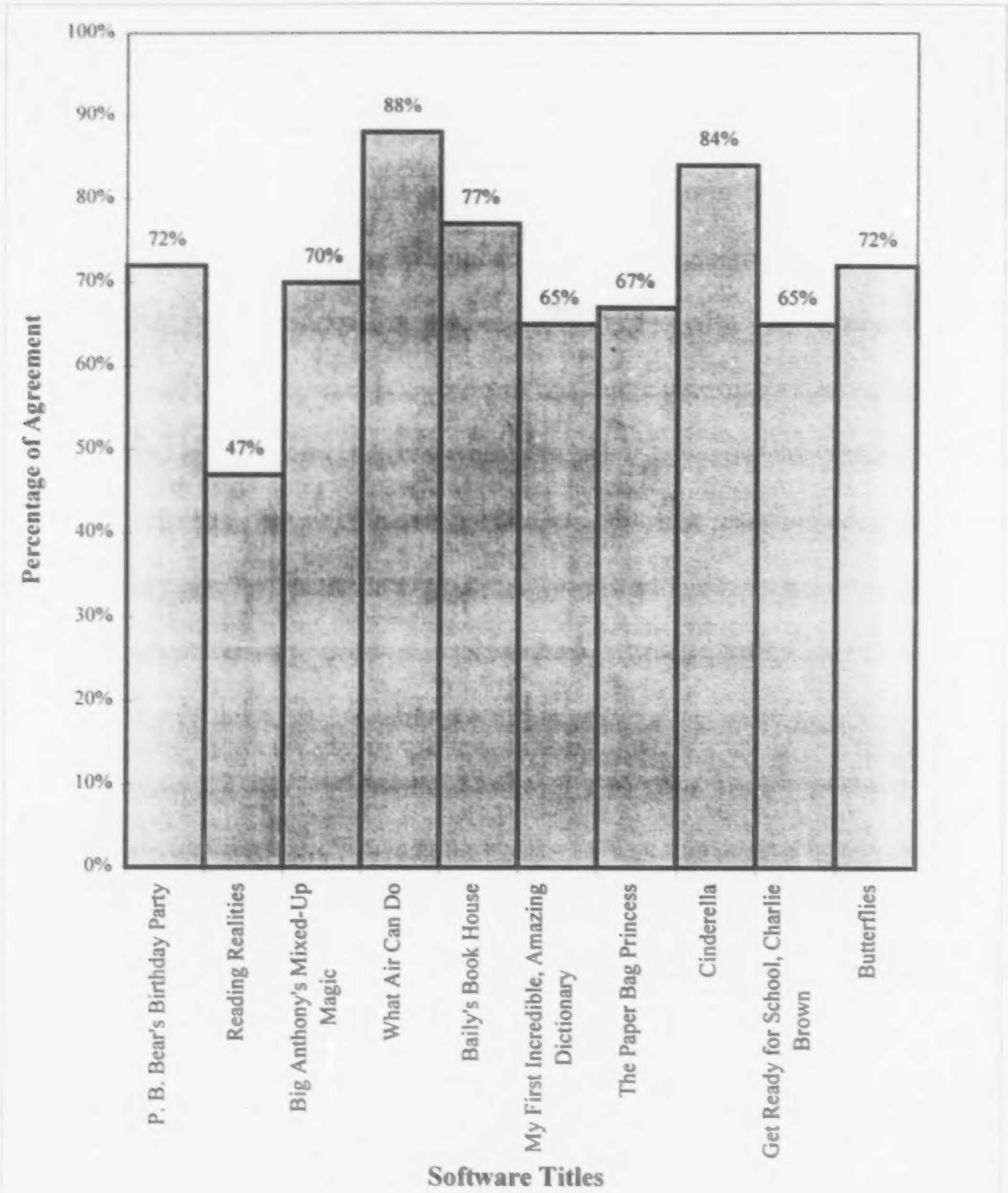


Figure 8. Percentage of agreement between graduate students and researcher regarding identification of applicable criterion per software package.

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may agree or disagree with. The software either has that capability or it doesn't. In some instances where a software package did offer this feature, the graduate student reviewer was unaware of that and marked that criterion as NA. An error such as this may be due to an inability to discover all of a package's abilities given the limited amount of time provided for previewing and the complexity of some of the packages.

Another factor that was observed during Review 3 was that occasionally an opinion would be formed by the reviewer during the exploration stage of the review. If the opinion were negative for whatever reason, (ie. the reviewer didn't care for the content of the program) the reviewers often checked all NAs, sometimes inaccurately, in order to represent their dissatisfaction. During these situations, reviewers were encouraged to check those items that accurately represent the true capabilities of the software, and not to let their initial reaction bias the evaluation.

A third factor affecting the variation between reviewers was an apparent misunderstanding of some of the terms used on the evaluation device. For example, "animated graphics" to some appeared to mean "cartoon-like" as opposed to the intended meaning of "moving." Within this same criterion, some checked "Provides animated graphics that illustrate concept or word" as applicable if the illustrations moved but didn't necessarily support what the text was saying.

A revised version of the checklist takes into consideration all of these findings (see Appendix Q). Criteria that needed rewording were discussed during the reviews with the reviewers so as to create new wording that was clearer, solidifying the reliability of the statements. The Skills section was separated into its own section that does not get scored but provides space for specific comments that will be helpful for the teacher reviewing or receiving the software. The revised version also includes a category rating of the overall effectiveness of a title, based on the percentage of criteria that are observable. The percents used in this rating coincide with those used during the analyses of the evaluation results. Additionally, an at-a-glance recommendation option for purchasing the software was included as a clear, concise indicator of the overall value of a package.

The Software Review

From the initial sample pool of 83 titles, 30 titles were selected for participation in the review process (see Table 1). Three of the 30 titles were immediately eliminated from further review during the first review by the undergraduate students. The CD-ROMs Wiggins in Storyland sent by Virgin Sound and Vision and Discis Fun House-Play to Learn series sent by Discis were both IBM versions of the software and therefore unable to be reviewed on the Macintosh computers available. Zurk's Rainforest Lab by Soleil Software was experiencing technical difficulties as it repeatedly crashed upon boot-up, thus prohibiting its review.

An analysis of the results of the evaluations from the initial review phase resulted in the elimination of eleven more titles using established criteria. In the case of multiple undergraduate reviewers in Review 1, the results of their evaluations were averaged, or if there were two reviewers, the higher score was used. Table 6 shows the results of the first round of evaluations, as well as the status of the titles based on the established

Table 6

Percentage of Criteria Items Observed From Phase One

Title	Score from Phase 1	Score from Phase 2	Status after Analysis 1
1. P.B. Bear's...	93%	80%	Advance
2. The Lion King	60%	60%	Eliminate
3. Jack and the Beanstalk	53%	80%	Discrepancy
4. Reading Realities	87%	80%	Advance
5. Word Munchers	67%	27%	Eliminate
6. Reader Rabbit 3	87%	60%	Discrepancy
7. Big Anthony's...	80%	67%	Discrepancy
8. Interactive Reading Journey	73%	60%	Discrepancy
9. What Air Can Do	73%	73%	Advance
10. Baily's Book House	73%	73%	Advance
11. Zurk's Learning Safari	40%	40%	Eliminate
12. My First... Dictionary	67%	87%	Discrepancy
13. Winnie the Pooh...	60%	67%	Eliminate
14. Kid Phonics	73%	67%	Discrepancy
15. Paper Bag Princess	80%	80%	Advance
16. Jo-Jo's Reading River	67%	40%	Eliminate
17. Storybook Weaver...	67%	53%	Eliminate
18. Sugar & Snails...	80%	40%	Discrepancy
19. Destination: Ocean	67%	53%	Eliminate
20. Cinderella...	60%	80%	Discrepancy
21. The Way Things Work	47%	40%	Eliminate
22. Get Ready...C. Brown	80%	73%	Advance
23. Pocahontas	13%	67%	Eliminate
24. Butterflies	53%	73%	Discrepancy
25. Wind in the Willows	93%	40%	Discrepancy
26. Destination: Rainforest	27%	53%	Eliminate
27. Make-a-Book	47%	60%	Eliminate

Note. If both scores were at or above the 73% mark, the title is labeled "Advance," indicating that it automatically continued on to be reviewed by the graduate students. A status of "Eliminate" indicates that both scores were below the 73% mark and therefore discontinued from further review. A "Discrepancy" status indicates that a discrepancy in scoring occurred, resulting in one score at or above the 73% mark and one score below; those titles continued on to the next round.

required score of 73% or more.

As a result of this initial analysis, the following 16 titles, listed randomly, continued on to the next review stage to provide another point of view regarding the software's effectiveness:

1. P.B. Bear's Birthday Party
2. Jack and the Beanstalk
3. Reading Realities
4. Reader Rabbit 3
5. Big Anthony
6. Interactive Reading Journey
7. What Air Can Do
8. Baily's Book House
9. My First Incredible, Amazing Dictionary
10. Kid Phonics
11. The Paper Bag Princess
12. Sugar & Snails and Kitty Cat Tails
13. Cinderella
14. Get Ready for School, Charlie Brown
15. Butterflies
16. Wind in the Willows

Analysis 2 of the evaluation process compared and averaged the x/15 scores of Reviews 1, 2, and 3. Additionally, the x/26 score is provided for further evaluation of the reviews by the researcher and graduate student (see Table 7). This analysis resulted in six more titles being eliminated from the list of potentially effective titles. Five of those eliminated titles received scores of 73% or more by the undergraduate reviewers, but below 73% in the x/15 scoring on the reviews by both the researcher and the graduate student. This type of discrepancy was considered grounds for removal due to the advanced instructional experience of the reviewers (as compared to the undergraduate students), in addition to the fact that the averaged score fell below 73%. The sixth title,

Table 7

Percentage of Criteria Items Observed From Phases One and Two

	Review 1	Review 2		Review 3			Status after
Title	x/15	x/15	x/26	x/15	x/26	Avg.	Analysis 2
Air	73%	73%	88%	85%	96%	83%	Advance
Baily's...	73%	73%	81%	69%	75%	74%	*Advance
Butterflies	53%	73%	88%	92%	87%	79%	*Discrepancy
Cinderella...	60%	80%	88%	80%	88%	79%	Discrepancy
P.B.Bear's...	93%	80%	73%	53%	52%	70%	Discrepancy
Rdg. Realities	87%	80%	85%	38%	29%	64%	Discrepancy
My...Diction.	67%	87%	85%	69%	74%	76%	*Discrepancy
Paperbag...	80%	80%	88%	53%	62%	73%	Discrepancy
...C. Brown	80%	73%	73%	47%	50%	65%	Discrepancy
Big Anthony	80%	67%	73%	71%	68%	72%	*Discrepancy
Jack/Beanstalk	53%	80%	69%	47%	48%	59%	Eliminate
Rdg. Rabbit 3	87%	60%	54%	57%	71%	66%	*Eliminate
Interactive Reading Journey	73%	60%	69%	60%	64%	65%	Eliminate
Kid Phonics	73%	67%	62%	58%	65%	65%	Eliminate
Sugar & Snails	80%	40%	46%	47%	35%	50%	Eliminate
Wind/Willows	93%	40%	46%	47%	50%	55%	Eliminate

Note. A status of "Advance" indicates that the title continued on to be field-tested due to the afore-mentioned criteria. A status of "Eliminate" indicates that the title was discontinued from further review. A "Discrepancy" status indicates that a discrepancy in scoring occurred, and therefore, continued on to the field-testing. The low average of Reading Realities is reflective of the dissatisfaction the graduate student reviewer felt after an initial reaction to the content of the software, which affected her scoring of the software. Asterisked titles are those that the graduate student reviewers indicated they would purchase for their classroom.

Jack and the Beanstalk, received a score significantly below 73% on the reviews by the undergraduate reviewer and the graduate/teacher reviewer, but a score of 80% by the researcher. In this case, the x/26 score was referred to to gain further information, which resulted in an average score below 73% and, therefore, elimination.

Two titles received scores at or above 73% on all reviews, when considering the x/26 scoring of Reviews 2 and 3, resulting in their qualifying to continue on to the field-testing portion of the review. The remaining seven titles involved some discrepancy across the five scores, but averaged close enough to the 73% mark to continue on to the field-testing review. Averaging the scores from all five evaluations weighed the results from Phases 2 and 3 more heavily than Phase 1, which is appropriate given the higher level of experience of these participants in teaching reading.

Findings from the comparisons of the three reviews resulted in the following titles continuing on to the final phase of the review process (the field-testing component):

1. P. B. Bear's Birthday Party
2. Reading Realities
3. Big Anthony's Mixed Up Magic
4. What Air Can Do
5. Baily's Book House
6. My First Incredible, Amazing Dictionary
7. The Paper Bag Princess
8. Cinderella, the Original Tale
9. Get Ready for School, Charlie Brown
10. Butterflies

All titles with an overall average of 73% or more were automatically qualified for the final phase of review. However, Reading Realities, Get Ready for School, Charlie Brown, and Big Anthony's Mixed-Up Magic, whose scores were not as substantial, were included due to other factors. Reading Realities, as has been mentioned, was included for the purpose of examining it further based on the potentially biased review it received. Big Anthony's Mixed-Up Magic was included because its score (72%) was close to the required 73% rating and the graduate student/teacher reviewers reported that they would purchase it for use in their classrooms. Get Ready for School, Charlie Brown was included because of the majority of strong scores it received and a large discrepancy ranging from 47% to 80% between the qualities reviewers observed.

The 10 remaining titles that showed potential for effectiveness based on Reviews 1, 2, and 3 were then observed under direct student use. This field-testing component would confirm or reject a software's anticipated effectiveness based on the first three reviews, reveal other strengths and weaknesses of the software, and answer any remaining questions regarding a title's congruency with, and therefore effectiveness as a supplement to, reading instruction.

Software Recommendations

The results of the field-testing, including strengths and weaknesses of the software based on the evaluations by the students and classroom teacher and the observations of the researcher, are listed below. Titles are listed in random order.

What Air Can Do and Butterflies Publisher: Discis

Intended level: PreK-3

Description: Both software programs are electronic books in the form of CD-ROM and consist of expository text. Each utilizes text alongside photographs to relay information about each topic. Students can read the text on their own or have it read to them by the computer as they "page" through each book.

Strengths: easy for students to use; appropriate reading level for first and second grade; uses quality children's literature; appropriate content; quality visuals- photographs; high quality sound- realistic synthesized voice and appropriate sound-effects; able to hear pronunciation of word, definition of word, syllabication of word, and have whole page read; words on screen are highlighted as computer reads them; font and size of text can be modified to suit individual needs; students were motivated to use, but not distracted by features offered, and interested in topics; teacher appreciated its application to topics that are part of the curriculum; clicking on pictures reveals word label for picture; students used features appropriately after minor initial excitement subsided; bookmark option saves page student is working on if reading is interrupted

Weaknesses: in some instances when a word is clicked on for pronunciation, the *phrase* in which the word is set is read as opposed to just the word; once commanded to read a whole page, computer will automatically continue reading whole book, even turning pages, until commanded to stop (lackadaisical child may sit back and relax); when the horn is clicked for the computer to "read," the words are highlighted in phrases of five to six words as opposed to one at a time; no other activities offered than reading the text- no comprehension activities involved (which would encourage a more concrete connection between the written word and spoken word); when page turned, picture sometimes remains the same (much to students' dismay); animated graphics not available to illustrate concepts discussed; definitions for words not helpful to or appropriate for first and second grade; as the pages are turned, the computer automatically plays background music which can be distracting and doesn't appear to support the text in any way

The Paper Bag Princess Publisher: Discis

Intended level: K+

Description: An electronic book version of R. Munsch's original work in the form of CD-ROM. This narrative, fictional text is accompanied by illustrations adapted from the book version of the story and can be read independently by the students, with help from the computer, or entirely by the computer.

Strengths: easy for students to use; inspired positive student responses (enjoyment of story); appropriate reading level for first and second grade; uses quality children's literature; appropriate content; high quality sound- realistic synthesized voice; able to hear pronunciation of word, definition of word, syllabication of word; able to have whole page read; words on screen are highlighted as computer reads them; font and size of text can be modified to suit individual needs; students were interested in and entertained by story and motivated to use, but not distracted by features offered; clicking once on pictures reveals label for picture; students used features appropriately after minor initial excitement subsided .

Weaknesses: in some instances when a word is clicked on for pronunciation, the *phrase* in which the word is set is read as opposed to just the word; once commanded to read a whole page, computer will automatically continue reading whole book, even turning pages, until commanded to stop (lackadaisical child may sit back and relax); when the horn is clicked for the computer to "read," the words are highlighted in phrases of five to six words as opposed to one at a time (which would encourage a more concrete connection between the written word and spoken word); no other activities offered than reading the text- no comprehension activities involved; when page turned, picture sometimes remains the same (much to students' dismay); definitions for words not helpful or appropriate for first and second grade; animated graphics not available for illustrating story events

Cinderella, the Original Tale   Publisher: Discis

Intended level: PreK-7

Description: An electronic book version of the well-known fairy tale in the form of CD-ROM. This narrative, fictional text is accompanied by illustrations and can be read independently by the students, with help from the computer, or entirely by the computer.

Strengths: easy to use; students enjoy the labeled pictures- the entertainment level of this was surpassed after only a few minutes; high quality sound- realistic synthesized voice; able to hear pronunciation of word, definition of word, syllabication of word; able to have whole page/text read; words on screen are highlighted as computer reads them; font and size of text can be modified to suit individual needs; uses quality children's literature

Weaknesses: students bored by story (indicated they would not like to use it again sometime and that the story was too long, at times during use students were not even looking at screen but were gazing around the room); when the computer was reading, some of the words were highlighted in black so that the words could not be seen; once commanded to read a whole page, computer will automatically continue reading whole book, even turning pages, until commanded to stop (lackadaisical child may sit back and relax); when the horn is clicked for the computer to "read," the words are highlighted in phrases of five to six words as opposed to one at a time (which would encourage a more concrete connection between the written word and spoken word); no other activities offered than reading the text- no comprehension activities involved; when page turned, picture sometimes remains the same (much to students' dismay); definitions for words not helpful or appropriate for first and second grade

Big Anthony's Mixed Up Magic Publisher: MECC

Intended level: K-4

Description: This CD-ROM presents an electronic book version of Tomie DePaola's Strega Nona Meets Her Match (traditional book is also provided) in which students can read the narrative, fictional text independently, with the computer's help in pronunciating individual words, or listen to the author read the text in it's entirety. Additional activities are provided in which students can explore the various settings of the story by "traveling" around Calabria and interacting with the pictures and characters.

Strengths: students highly motivated by activities provided; uses quality children's literature; familiar character pleasing to students and teacher; appropriate level for second grade or strong first grade readers; high quality graphics (adapted from book) and storytelling; ability to click on individual words to have them highlighted and pronounced by the author; relatively easy for students to use; high-quality sound- music and realistic voice

Weaknesses: must click on every page to stop computer from reading; when computer is reading, words are not highlighted; sound was broken and choppy in parts on some computers; more game-like opportunities than reading opportunities; games (mainly noneducational) distracted from reading of text- students didn't want to leave the "hidden object" game to read the story; interactions with pictures during activities provide little to no support in developing reading abilities; little development of skills for beginning readers; classroom teacher would not purchase for use in classroom; graphics in the "read book" section are not animated to illustrate story events as they are in the game section

My First Incredible, Amazing Dictionary Publisher: Dorling Kindersly

Intended level: PreK-2

Description: An electronic picture dictionary and reference tool in the form of CD-ROM. Provides students with a bank of various words in alphabetical order. For each word, the students can read and hear the word pronounced, read and/or hear the definition of the word, and view an illustration of the word. Additionally, the package provides three games that range from using supplied words to answer questions, to spelling a word when supplied with a picture clue, to matching an object to the sound it makes. All words used in the games can be found in the dictionary section of the software.

Strengths: students highly interactive, excited and motivated to use, were aware that new facts could be learned through using the software, appreciated that the computer could read a word for them if they didn't know it, liked how pictures moved; high quality animated illustrations and sound effects available that support words being defined; provides cross-referencing and easy transfer to words/categories that are related to word looked up; utilizes quality text (dictionary); provides dictionary-manipulating skills; good for language development, word studies (antonyms supplied for some words), knowledge of alphabet; classroom teacher would purchase and use; appropriate reading level and content; relatively easy to use but students had hard time figuring out how to go back to main menu; can print out screen containing all portions of the definition or copy onto the hard drive's clipboard for transfer into other texts

Weaknesses: when commanded to read text, whole definition is highlighted at once as opposed to one word at a time (which would encourage a more concrete connection between the written word and spoken word); not able to hear just one word in the definition read at a time; activities too easy for advanced second grade students; games provided practice skills ("Spell It") and present words ("Guess What") out of context, or do not contain any words at all in some of the levels ("What's That Noise?"); games do not reinforce important skills addressed in grades one and two; games distracted some students from the more valuable activities (the dictionary) the software program had to offer

Get Ready For School, Charlie Brown Publisher: Virgin Sound and Vision

Intended level: PreK-2

Description: An electronic picture dictionary in the form of CD-ROM that provides emerging readers with words that can be accessed either through alphabetically ordered lists or through illustrated scenes that provide objects within settings. Each entry provides the word accessed, a definition, an illustration, a sentence that accompanies the illustration, and a Peanuts cartoon that contains the word in it. The package also includes seven games that accompany each scene and use the words provided in the dictionary in a variety of ways, such as in creating sentences, rhyming, spelling, and story writing.

Strengths: students highly motivated to use, entertained by and interactive with software; some activities reinforce print skills (such as structural analysis and sight words); high quality graphics and sound; relatively easy to use; opportunities to view word in a variety of sentences and situations; provides cross-referencing and easy transfer to words/categories that are related to word looked up; utilizes quality text (dictionary); provides dictionary-manipulating skills; good for language development, word studies, knowledge of alphabet; scenes depict experiences a variety of students can relate to (playground, classroom, bedroom, outdoors); all words used and explored can be easily accessed for definition at any time

Weaknesses: very easy skill-wise, even for first grade- may be appropriate for beginning first; teacher would not purchase because too easy; most games provide skill practice out of context (ie. spelling a word that Linus reads, creating rhyming words in isolation using given phonogram and inserting various initial sounds); many games have little educational value (ie. making sentences out of provided words- sentences do not resemble true language or have little meaning), do not involve reading, or address skills too low for first grade (concentration game for matching pictures, dress Charlie Brown for school); only selected words can be clicked on for computer identification; animation of objects in scenes does not support definition of word

P.B. Bear's Birthday Party Publisher: Dorling Kindersly

Intended Level: unknown

Description: An electronic book version of this narrative, fictional text about P.B. Bear in which some of the nouns have been replaced with pictures. Students can read the text independently, read it with help from the computer, or listen as a narrator reads it. The animated illustrations resemble clay-mation and support events of the text. Children can interact with the text as well as the illustrations, not only by having the text read for them but also by identifying the words represented by the pictures that replace text. Ten games are also provided that accent the various parts of the story.

Strengths: uses quality children's literature; high quality, animated illustrations that support text; first grade students excited, motivated and engaged in use; easy for students to use; high quality synthesized voice for clear speech; allows for words to be read upon command; models fluent reading through the option of having the narrator read on a page-by-page basis; allows for interaction with text and illustrations

Weaknesses: although games are related to the text, most do not build reading skills (ie. popping balloons before they fly off the page, matching which color robe will coordinate with P.B. Bear's pajamas, matching the shape of a gift to the shape of a package, etc.); games have tendency to be somewhat distracting from text- some students were reluctant to leave games and go to the text; too easy and young for second grade use (more appropriate for first), second graders reacted poorly to it; clicking on a word for pronunciation results in a whole phrase being highlighted and read, as opposed to just the one word being read; when the computer is commanded to read, the reading is faster-paced than the highlighting of the words, lacking a correspondence between what is written and what is spoken

Reading Realities- Level 2 Publisher: Teacher Support Software

Intended level: Grade 2

Description: This realistic fiction text in the form of a floppy disk presents real-life school, family, and personal issues and situations that second graders may have to deal with. The text is presented alongside pre-, during-, and post-reading activities that encourage such activities as predicting, vocabulary development (through supplied definitions), and comprehension building through open-ended and closed questions. Additionally, teachers have the option to program the texts for cloze activities, both with and without clues.

Strengths: easy for students to use once the program is open; educationally-sound format provides appropriate, interactive reading activities related to the text (ie. predicting, answering comprehension questions- open-ended and literal); provides opportunities for group discussion if students are working in groups; provides opportunities for writing about, and responding to, text; students enjoyed using the software and the interaction/ integration of reading and writing; students could relate to and interested in topics of texts; definitions provided are appropriate for and understandable to designated age level;

provides pronunciation of one word, one sentence, whole page, or whole story, depending on how teacher programs it; manual helpful in operation and acclimation to software's capabilities; provides management system to keep track of individual students' work

Weaknesses: complex installment and boot-up; very difficult to lead children through the complex process of opening the program, different computers have different ways of presenting icons, files, etc.; voice synthesizer of poor, robotic quality, difficult to understand words that had been prompted to be read; content of stories needs to be used under close direction and scrutiny of teacher as they provide realistic, dramatic situations (for example, So What If I'm Fat?, Kids Don't Like Me); only selected vocabulary words have definitions provided for them; illustrations are few in number, lack quality and are not animated; insufficient support for students who are lacking the necessary skills for reading the texts on their own

Baily's Book House Publisher: Edmark

Intended level: PreK-2

Description: This interactive CD-ROM provides practice of emergent literacy skills and beginning reading and writing through a variety of games and activities.

Strengths: students motivated to use; provides exposure to emergent literacy skills such as letter recognition, letter/sound association, basic sight words, phonograms; provides writing opportunities; utilizes some skills situated in real reading/writing opportunities; Read-a-rhyme activity presents rhyming within authentic texts of nursery rhymes; most activities provide quality voice synthesizer to model reading fluently; quality illustrations, some animated to support text

Weaknesses: many activities present skills out of context, such as "Letter Machine" in which students type in a letter to have it pronounced for them and hear an alliterated phrase using that letter accompanied by a picture; first grade students and teacher commented that the activities were too easy (ie. in "Edmo and Houdini" the students click on one of six words to make the dog go under, over, behind, etc. the dog house, and in "My Friend" create a funny creature by selecting from supplied adjectives to change the appearance of its arms, hair, etc.), may be more appropriate for Kindergarten-beginning of first grade; teacher would not purchase for her classroom because presentation of skills is too easy for first grade; does not offer reading/ identification of individual words by computer, reads whole phrase or sentence

Summary of Findings

As a result of this study, an evaluation device has been developed which includes criteria that are congruent with the Interactive model of reading instruction. This field-tested checklist can be used when determining the potential effectiveness software will have in supplementing the reading instruction of first and second graders. The criteria included on the checklist are reflective of what actual educators of first and second grade students value and desire in the software they use with their students.

After a comprehensive and multi-leveled review of available reading software, certain titles appear to reflect moderate congruence with the Interactive model of reading instruction. With the help of the checklist and observations of direct student-use, recommendations have been made regarding specific software packages and their potential to effectively supplement the reading instruction of emerging readers.

This study describes in detail ten titles, including their contents, skills addressed, strengths and weaknesses. Educators may use these summaries and recommendations as a significant aid in their quest for locating software to use in their classrooms.

CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS

Investigating the Effectiveness of Software: Restatement and Justification

Use of CBRI: Past and present. A review of the history of CBRI revealed how computers were used in the past as a tool for reading instruction. Software was originally skill-and-drill oriented, which reflected the reading instruction of the 1960s, 1970s, and into the 1980s. Today, the discovery of new information has resulted in the development of a different approach to reading instruction, and technology has evolved providing new capabilities that can aid students in the learning process.

Skill-and-drill software is no longer acceptable by educators nor seen as propitious to students' growth in reading, although some of what is published maintains this format. In planning their instruction, educators will benefit from knowing what computers are capable of now as compared to earlier abilities, how these new capabilities can enhance students' growth in reading, and what they can expect from available software.

Present day hardware and software options surpass the quality that was available even as little as five years ago. Two important developments, the introduction of CD-ROM and improvements in the sound quality of speech synthesizers have helped change the nature of computer-use, and thus how it can be used for instruction. This study encompasses the evolution of computers into a new age and the increased knowledge about reading instruction.

In the 1990s, computers have become more readily available to educators and students in elementary schools, and the amount of reading software available commercially is increasing every year. The permanent nature of CBRI is indicated by these two facts, the history of CBRI, and the research regarding the effectiveness of CBRI.

The importance of examining software. Given that the computer can be such an important tool in facilitating student growth, educators need to examine how it can be most effectively used, which involves the selection of software. Research has shown that students' instructional time on a computer can be beneficial to their growth in reading if the computer time is wisely spent (McKenna & Watkins, 1995; Reinking, 1988). This study revealed that many of those studies that found CBRI to be effective utilized not commercially available software but software specially prepared by the researchers to suit the needs of the respective studies.

This fact, coupled with the knowledge that there is a veritable plethora of commercially prepared reading software, substantiates the need to critically review what is being formulated for school use. It also indicates that the potential of CBRI may not be fully tapped through the use of commercially available software. The effectiveness of computer based reading instruction is partially dependent on the software that is chosen for student use.

Although research has suggested that CBRI can be effective, available software has not been examined systematically in order to determine which titles are pedagogically sound and congruent with what we know about reading instruction. Reviews have been conducted based on individual experiences with the software resulting in personal recommendations. However, this study represents comprehensive analyses conducted by a variety of educators in a variety of settings.

Educators are cautioned to refrain from haphazardly selecting and using software in their classrooms. Just as they would meticulously inspect a new basal series or book, educators are wise to closely examine software that students will spend valuable classroom time using. Software not selected carefully can waste the students' and the teacher's time by providing experiences that are: 1) not congruent with existing instruction, 2) not at the appropriate level of the students', and/or 3) not cohesive with practiced teaching approaches or topics of study.

Each minute of every student's day should be productive, including the time spent on the computer. Educators must select software that is congruent with how reading is taught in their classrooms. Why waste precious classroom time and money on software that may have little-to-no educational value, may not be worthwhile because it presents reading in a manner different than how it is being taught in the classroom, and that presents students with activities that may not aid in their growth as readers?

With these questions in mind, this study determined which characteristics should be evident in software in order for it to be considered educationally sound as a supplement to Interactive reading instruction. Additionally, the study attempted to identify, through a systematic analysis, software that exhibits those qualities and can therefore be recommended for use in first and second grade classrooms.

Conclusions Based on Research Findings

The survey. Responses on the survey revealed educators' reactions to the software that is currently available. Few educators felt extremely satisfied or extremely dissatisfied with the software that is available for use in their classrooms, with most reactions falling in the middle range of slightly satisfied or slightly dissatisfied. From this it can be concluded that, overall, educators find commercially published software to be of relatively average quality. For the most part, they perceive it as being neither outstanding nor failing.

This overall mediocre response is congruent with the relatively average ratings assigned to the software that was reviewed during the study. These similar reactions from two separate situations, both the classroom point-of-view and the research position, reflect a continuity in the perceived quality of software. Various educators expressed limited enthusiasm for the software. The responses can be viewed as being both positive and negative statements about available software. They may be considered positive in that few perceive the available software to be worthless, yet negative in that few find use of the software to be extremely advantageous.

Additionally, the survey responses indicated specific characteristics that educators are seeking in the software that they use to supplement their reading instruction, based on their knowledge of how children best learn how to read. Identified characteristics were descriptive of the Interactive model of reading instruction. Subsequently, educators indicated a lack of interest and value in software that practiced skills in isolation. Software containing characteristics other than those indicated is not considered to be a valuable supplemental tool for an Interactively instructed classroom.

The evaluation device. One result of this study was the formulation of a succinct checklist that can be used by educators in determining which software packages will suit the needs of their students. This checklist encompasses and represents what educators consider to be desirable characteristics of reading software, as indicated on the survey, as well as some additional criterion reflective of current knowledge of reading instruction.

The research conducted in this study revealed that no such evaluation device existed that could rate the potential effectiveness of a software program based on its congruency with the Interactive model of reading instruction. Previously available checklists evaluate mainly technical aspects of a program, or are applicable to a range of grade levels. Using those evaluation devices, a first or second grade teacher selecting software to use with her reading program could not assess specific educational characteristics of a reading software program, thus depicting the need for this checklist.

During the reviews, all of the criteria on the checklist were found to be observable on at least two occasions and up to as many as 30. From this fact it can be concluded that all the criteria are appropriate considerations when determining the effectiveness of a package.

Upon being used by a variety of educators, the checklist was found to be subject to user interpretation in some instances. Efforts were made to reduce this phenomenon, however some items on the checklist remained appropriately susceptible to individual opinion. For example, item number three under the Content section states, "Reflects experiences that first or second graders can relate to or have knowledge of." This characteristic may vary from one student body to the next, depending on the students' backgrounds. Therefore, software that students living in New York City can relate to may not be as appropriate for students living in rural Montana. In an instance such as this, the reviewer's individual opinion about the software is acceptable and encouraged; **each teacher must select software that meets the needs of her students, which will vary from school to school**.

Also, through using the checklist during reviews it became apparent that each individual teacher's overall opinion of a program could affect the effectiveness of using the program in class. If a teacher is biased toward a program for any reason, regardless of its educational characteristics, that program may not be an effective supplement to a reading program.

This was observed with the Reading Realities program in which one reviewer was so distracted by her perception of the content of the text that it affected her view of the program's entire educational worth. It may not be prudent to force this teacher to use this software based on someone else's evaluation of it. Once again, individual opinion of software must be accepted, just as judgments of other classroom materials are.

The software. The 27 titles evaluated represented the products from 14 different publishing companies, large and small, and included titles that were both well-known to educators and obscure. The scope of the software reviewed in this study included a variety of genres and types. Some presented games and activities intended to develop strategies, skills, sight words, and vocabulary. Others were electronic books, both fiction and nonfiction, that presented reading in a non-traditional format with the goal of

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developing process reading skills or providing scaffolding and a model of fluent reading. The titles reviewed represented a moderate sampling from the gamut of available reading software.

The end result of the review process was the identification of 10 titles that appeared to be congruent with the Interactive model of reading instruction. A detailed analysis of each title is provided, including the apparent strengths and weaknesses that were detected by the laboratory review and/or the field-testing by actual students.

Each title exhibited some strong characteristics, yet also neglected other attributes that would have increased the congruency and thus improved the quality of the software. No titles received a "good" or "excellent" rating on the checklist, and all exhibited flaws under direct student use. Because each had weaknesses as well as strengths, **it can be concluded that none of the titles that were reviewed by this study are outstanding supplements to existing first and second grade reading programs**. This finding is compatible with McKenna's and Watkins' (1996) discovery that electronic books, in their current form, are not likely to aid students' acquisition of decoding skills, a focus of primary reading instruction.

Although no titles were considered to be "excellent" extensions to reading instruction, it can be concluded that the quality of software is improving. In this dawn of a new age of CBRI, characteristics are being represented in software that will aid students to grow as readers. Improvements in the quality of speech synthesizers has made computers an effective support for beginning readers as they tackle texts independently. Accessing the pronunciation of a word has been proven to aid in sight word vocabulary development and allows students more independence in experiencing a text without the help of another student or the teacher. This unique quality of the computer is an asset to CBRI. It is noteworthy to mention that the students involved the field-testing also expressed an appreciation for the realistic, human-quality speech synthesizers.

The field-testing also revealed the power of motivation computers can elicit as students were excited about their reading experiences with particular software and were anxious to use the computer again in some instances where the software was found to be fairly effective. Students' ability to interact with text, animated graphics, and highlighted words provided a multimedia experience for the pupils and appeared to be beneficial elements of CBRI. These features, present on many of the packages, are not available in traditional reading experiences.

Although the educational quality of software is improving, there is still room for growth. Based on all of the reviews, none of the titles received averaged ratings above 83%, with most titles falling in the range of 64% to 79%. For the purposes of this study, ratings of 81% to 87% are considered to be "good" while 73% to 80% is "fair", or marginally adequate. One title had an average rating over 80% (83%), and 6 titles were rated between 73% and 79%. These ratings are indicative of an impoverished selection of software that is congruent with how reading is taught today. The actual percentage of available reading software to be deemed potentially effective is low.

Additionally, there were only two situations in which all three reviewers rated the software at 73% or above. Most instances involved at least one of the reviewers rating the software at below 73%, the minimum score required for adequacy. None of the titles were collectively perceived as having enough strengths to be considered solidly "good" or "excellent."

Software publishers need to fully recognize the importance of including the characteristics represented on the checklist in the software they prepare for school use in order to make software packages of "excellent" quality. For example, few of the software programs provided comprehension development opportunities, such as presenting questions about a text that provoke higher level thinking and providing feedback that will help students to refine their comprehension. At a time when the importance of reading for meaning is fully recognized, this lack of attention to developing comprehension is inadequate, if not intolerable.

Additionally, relatively few titles reinforce the use of visual, structural, and contextual cues, which are commonly taught to students as strategies for decoding. Encouraging students to draw on prior experiences, building background knowledge, and integrating reading and writing were further characteristics that were meagerly represented in this sampling of software.

The relatively low percentage ratings were confirmed in the field-testing component, during which further strengths and weaknesses of the software became evident. Each of the 10 finalist titles were lacking in important areas. Apparent weaknesses indicated that none of the programs were completely outstanding. In some cases the presence of two or three more attributes (represented on the checklist) would have made the software a valuable resource and supplement to a reading program.

For example, the Discis titles What Air Can Do, Butterflies, and The Paper Bag

Princess all performed relatively well during both the laboratory review and field-testing components. However, as indicated in their analyses, the presence of animated graphics, readings by the computer of individual words when prompted as opposed to phrases, and comprehension development would have significantly strengthened the quality of the packages.

Other packages demonstrated that occasionally the motivational factor that is important often outweighed the educational value, causing an imbalance between the two. Students will require close adult supervision and guidance when using the software due to the entertainment options available on many of the packages. Student-use clarified the fact that many packages include an entertainment portion that, although it is motivational, does exceed the educational value in that the entertaining portion often had little-to-no educational value. **Frequently students were so enticed by these options that they avoided the educational activities.** The presence of activities displaying greater entertainment than educational value may be due to the fact that many packages are designed for both home and school use so as to appeal to a wider market.

The condition of no software rating as "excellent" also supports the contention that CBRI should supplement, not supplant, existing, traditional reading tutelage. Because all of the software represented in this study was lacking in areas important to the development of emerging readers' skills, it can not be expected to take the place of existing instruction or the teacher. However, it can be used to reinforce certain skills as an extension to regular instruction.

Due to the fact that none of the packages received high scores from all reviewers and some of the criterion on the checklist were subject to reviewer opinion, **it can be concluded that software that is effective for one classroom situation may not meet the needs of another**. As a result it is difficult, in a sense, to provide a list of software found to be effective, which was one of the original intentions of this study, as what is considered effective was observed to vary from situation to situation. As an alternative, what is provided are detailed descriptions of software that was found to be potentially effective based on the attributes, strengths, and weaknesses exhibited in accordance with the Interactive model of reading.

Overall it can be concluded that there are not as many potentially effective titles available as the study hoped to reveal, given the abundance of available software, advanced technological capabilities and current knowledge of reading instruction for emerging readers. For the most part, commercially prepared software does not appear to be fully harmonious with the Interactive model of reading instruction. Observations of the software under direct student-use revealed many shortcomings accompanying the strengths of the software.

Implications of the Findings

The survey. The fact that the survey results indicate few responses of extreme satisfaction with available software implies that changes need to occur in the software in order for educators, who are knowledgeable about reading instruction, to consider them effective supplements to their reading programs. Students will benefit more from their time on the computer if changes are made that result in educators being extremely satisfied. Survey responses indicate that there is room for improvement. The lack of extreme enthusiasm for available software implies a lack of congruence between how reading is being taught in schools and the software materials offered as supplements.

Responses regarding specific desirable characteristics implies that many educators do subscribe to the Interactive model of reading, as other reports have also shown. Software publishers would be wise to refer to these characteristics identified by educators when developing future packages. Characteristics identified as those that educators seek when they are purchasing software may be indicative of areas of need in software.

The evaluation device. The checklist that was developed is detailed in order for educators to use it in locating potentially effective software. Originally, the checklist was meant to be used primarily by school personnel. However, these criteria could also be referred to by, and thus aid, publishers when they are developing software that they intend to be effective learning tools for students. Using this device during software development may aid publishers in producing software that focuses specifically on educationally sound practices for beginning readers and, as a result, may futuristically improve the overall quality of reading software available for first and second graders.

Given the results of the reviews, it seems that publishers are not encompassing as many pedagogically sound principles as they could. Perhaps more energy is being devoted to the presentation of the material and other technical areas. It is time to use the impressive, new capabilities to fully administer the identified educationally sound practices. Striking a balance between the two would aid students in their literacy development.

The fact that some reviewers indicated they *would* purchase the software for use in their classrooms despite a relatively low rating implies that even educators, when they are critically reviewing a package for educational value, may be swayed by the "bells and whistles" of current technology, and should therefore be cautioned against forming initial impressions. Likewise, negative initial impressions can be equally damaging, as was illustrated.

The software reviews. Both the laboratory reviews and field-testing revealed that entertainment levels did exceed educational value in many situations, resulting in those titles being potentially less effective. Effective software utilizes entertainment, or motivational, levels to concurrently stimulate students to perform educational tasks. The two do not have to operate separately and are most effective for learning purposes when they occur simultaneously. Harnessing the entertainment factor into learning activities needs to be accomplished with more success. Software designed for home tends to have a higher entertainment level. Therefore, software designed for both home *and* school use is not as effective as a learning tool as it would be if it were designed solely for school.

Much of the software reviewed was designed to suit a wide range of ages, as is indicated on the packaging. However, although this software is intended to meet the needs of a wider market, it is often beneficial to few because sixth graders have very different needs in reading than first graders. Therefore, reading software will be more effective when it is designed to suit the needs of a particular level, just like any basal or other reading package.

Until more effective software is developed, educators will need to select software for use in their programs carefully to match their needs. Use of the developed evaluation device will aid in this process. Software should be chosen based on its strengths and its ability to complement existing reading instruction on a per situation basis. Areas not reinforced by the software, such as comprehension, will have to be addressed in other classroom activities, possibly related to the software, to compensate for these weaknesses. Teachers should consider what the students will need to know before using the software.

Once software has been selected, teachers will need to closely monitor students as they use the software in order to guide them in enhancing their growth as readers. Time spent on the computer can only be valuable if students can capitalize on the educational worth of the software. Teachers can aid in this by considering how the software could be used to extend student learning, for example group configurations during use and specific lessons.

Recommendations for Further Studies

One of the results of this study is the provision of recommendations regarding the potential effectiveness of a sampling of available software. This study has not proven the effectiveness of certain titles when used in conjunction with an existing reading program as compared to programs that may not use CBRI. Research and education would benefit from an extension study involving the use of the identified potentially effective titles in a structured program to indicate the level of their effectiveness as supplements to traditional reading instruction. It would be helpful to know if students using specific commercially available software could achieve the accelerated improvement that students using specially prepared software made in other studies.

Educators have also indicated an interest in the ongoing educational review of titles that were either not included as part of this study or have recently become available by publishers. Teachers have appreciated the information that has resulted from this study and would value future recommendations of supplementary titles.

Additionally, this study focused solely on the reading instruction of first and second grade students. Establishing separate desirable characteristics of software to be used in the Intermediate grades is necessary as the needs of older readers are different. As computers become more prevalent in schools, there are many good reasons for all educators to closely examine how CBRI can most effectively enhance existing instruction, in order for it to be used most advantageously.

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Appendix A

Survey Cover Letter

March 1, 1996

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To Whom It May Concern:

As a Master's degree student at Central Connecticut State University, I am conducting a research study that I hope will be beneficial and interesting to educators involved in the teaching of reading. The purpose of the study is to identify quality computer software programs that are proven to be effective for supplementing reading programs at the first and second grade levels.

To aid in this study, I am requesting the help of local school systems in order to acknowledge what is considered important and effective in actual classroom settings. Your assistance in passing this survey along to the persons in your school who are knowledgeable and/or interested in this area would be deeply appreciated. In return for the help supplied by your school, I will be happy to return the favor by sending the list of programs that this study finds to be effective supplements to first and second grade reading programs.

If you have any questions or concerns please feel free to contact me. I can be reached at CCSU at 832-2175 between 12:00 and 4:00, Monday through Thursday. Thank you in advance for your assistance in this research study.

Sincerely,

Carolyn J. Case

Appendix B

School Letter of Explanation

March 1, 1996

Dear Colleague,

In today's world of rapidly-advancing technology, there is a growing use of computers for a variety of purposes. Since the 1960's, elementary schools have realized the computer's potential for aiding in classroom instruction, particularly with reading instruction. Research shows that use of computers can be an effective means of improving students' reading ability. Software publishing companies have also realized that capability and have thus flooded the market with a plethora of software to choose from. Unfortunately what they provide is not always pedagogically sound. Finding software that is actually effective in supporting children on the road to becoming better readers can sometimes seem like an overwhelming task to educators.

As a graduate student in Reading at Central Connecticut State University, I am conducting a research study that will assist educators in that task. Specifically, I am interested in developing an evaluation device for assessing the quality of software. Once that device has been established, I will use it to identify computer **software that is effective as a supplement to reading programs at the first and second grade levels.** Software found to be effective will be compiled into a list, which will then be available for educators to refer to when selecting software to complement their own programs. I am requesting your help.

I invite you to participate in this study by providing information regarding characteristics you look for in software and titles of effective software intended to supplement a reading program for first and second graders. Your experience and input is greatly needed and will help to make this study more useful and valid. Your voice will represent which software schools are actually using, and the characteristics in software that *schools* see as significant and effective for helping to improve first and second graders' reading ability.

If you are willing to participate, please fill out the enclosed form as completely as possible and return it in the self-addressed stamped envelope. I will be happy to send you the results of this study, which will be a list of titles of software found to be effective, including a brief description of each program. I hope this list will also be helpful to other educators, classroom teachers, and/or media specialists that you work with.

If you have any questions regarding this research study, please feel free to contact me. I can be reached Monday through Thursday between 12:00 and 4:00 at (860) 832-2175. Thank you in advance for taking the time to assist in this research study. Your help is greatly appreciated.

Sincerely,

Carolyn J. Case

Appendix C

Expert Letter of Explanation

March 14, 1996

«name»
«address»

Dear «sal»:

In today's world of rapidly-advancing technology, there is a growing use of computers for a variety of purposes. Since the 1960's, elementary schools have realized the computer's potential for aiding in classroom instruction, particularly with reading instruction. Research shows that use of computers can be an effective means of improving students' reading ability. Software publishing companies have also realized that capability and have thus flooded the market with a plethora of software to choose from. Unfortunately what they provide is not always pedagogically sound. Finding software that is actually effective in supporting children on the road to becoming better readers can sometimes seem like an overwhelming task to educators.

As a graduate student in Reading at Central Connecticut State University, I am conducting a research study that will assist educators in that task. Specifically, I am interested in developing an evaluation device for assessing the quality of software. Once that device has been established, I will use it to identify computer **software that is effective as a supplement to reading programs at the first and second grade levels**. Software found to be effective will be compiled into a list, which will then be available for educators to refer to when selecting software to complement their own programs. I am requesting your help.

I invite you to participate in this study by providing information regarding characteristics you look for in software and titles of effective software intended to supplement a reading program for first and second graders. Your experience and input is greatly needed and will help to make this study more useful and valid. Your voice will represent which software educators are actually using, and the characteristics in software that *educators* see as significant and effective for helping to improve first and second graders' reading ability.

If you are willing to participate, please fill out the enclosed form as completely as possible and return it in the self-addressed stamped envelope. I will be happy to send you the results of this study, which will be a list of titles of software found to be effective, including a brief description of each program. I hope this list will also be helpful to other educators, classroom teachers, and/or media specialists that you work with.

If you have any questions regarding this research study, please feel free to contact me. I can be reached Monday through Thursday between 12:00 and 4:00 at (860) 832-2175. Thank you in advance for taking the time to assist in this research study. Your help is greatly appreciated.

Sincerely,

Carolyn J. Case

Appendix D

Survey

Computer-Assisted Reading Instruction

Please return completed forms by March 22, 1996

Position/ Grade(s) you teach____

1) What characteristics/features do you look for when you are **selecting** software that will complement your reading instruction program for first and second graders? (Please be specific and tell why each characteristic is important to your program.)

2) How would you rate your satisfaction with the quality of reading software available for first and second grade students **from software publishing companies**?

Very satisfied — Very unsatisfied
4 - - - - - - 3 - - - - - - 2 - - - - - - 1

If you are unsatisfied with what is offered, please state why.

3) What are the characteristics/features of the most effective programs you **currently** use with your first/second grade reading program? (Please be specific and tell why each characteristic is important to your program.)

4) How would you rate your satisfaction with the quality of reading software available for first and second grade students' use **in your school**?

Very satisfied — Very unsatisfied
4 - - - - - - 3 - - - - - - 2 - - - - - - 1

If you are unsatisfied, please state why.

(over, please)

5) What are the software titles you have found to be most effective for reading instruction with first and second graders?

Title	Publishing Company

REQUEST FOR STUDY RESULTS

Yes, please send me the results from your study including the list of titles of effective software for supplementing reading instruction at the first and second grade levels.

NAME________________________________

ADDRESS______________________________

____

PHONE________________________________

**All responses to this survey will be kept confidential. Individual responses will not be shared with schools by the researcher. No names of individuals or school systems will be referred to during the study, or after its completion, at any time.*

Appendix E

Titles Selected

Publisher	Title
Broderbund	1. Alientales
	2. Dr. Suess's ABC
	3. New Kid on the Block
	4. Where in the World is Carmen
San	Diego- Jr. Detective
Edition	
Byron Preiss Multimedia Co., Inc.	5. The World of Totty Pig
Compu-teach	6. Joshua's Reading Machine
	7. Once Upon a Time
Creative Wonders	8. ABC Schoolhouse Rock
Davidson & Associates	9. Davidson's Kid Phonics
	10. Reading Adventures in Oz
	11. Reading Blaster
Discis Knowledge Research, Inc.	12. Butterflies
	13. What Air Can Do
	14. Cinderella
	15. The Paper Bag Princess
Disney Interactive	16. Winnie the Pooh and the Honey Tree
	17. Lion King
	18. Pocahontas
Don Johnston	19. A Day At Play
	20. K.C. & Clyde in Fly Ball
	21. UKanDu Littlebooks
Dorling Kindersly	22. My First Incredible, Amazing Dictionary
	23. The Way Things Work
Edmark	24. Destination: Castle
	25. Imagination Express Series
Educational Activities, Inc.	26. Core Reading and Vocabulary Development
	27. Solutions
Educational Publishing Concepts	28. First Steps to Comprehension
	29. Primary Steps to Comprehension
Electronic Arts	30. Eagle-Eye Mysteries (original)
	31. Peter Pan
Entrex Software, Inc.	32. Sugar & Snails and Kitty Cat Tails

Gamco	33. Undersea Reading for Meaning
Great Wave Software	34. Daisy's Castle
	35. Reading Maze
	36. Reading Search: In Search of the Lost Folk Tales
HarperCollins Interactive	37. If You Give a Mouse a Cookie
Hartley Courseware	38. Summertime on Cherry Street
Houghton-Mifflin	39. C.D.'s Story Time
	40. Create Your Own Adventures with Curious George
	41. The Polar Express
The Learning Co.	42. Interactive Reading Journey
	43. Read, Write, & Type
	44. Reader Rabbit 2
	45. Reader Rabbit 3
	46. Reader Rabbit's Reading Development Library
	47. Treasure Mountain
MECC	48. Word Munchers
Microsoft	49. How the Leopard Got His Spots
	50. The Magic School Bus Explores the Solar System
	51. The Magic School Bus Explores the Human Body
	52. Microsoft Explorapedia- The World of Nature
Mind Play	53. Jo-Jo's Reading River
Mindscape, Inc.	54. Merriam-Webster's Dictionary for Kids
	55. Wonderland
National Geographic Software	56. A World of Animals
	57. A World of Plants
Optimum Resource	58. Sticky Bear's Reading Room
Orange Cherry/ New Media Schoolhouse	59. The Wind in the Willows
Queue	60. Fun Around the House
	61. The Greatest Children's Stories Ever Told
	62. Tales From Long Ago and Far Away
	63. The Velveteen Rabbit
Random House	64. Jump Start First Grade
	65. Jump Start Second Grade
Sanctuary Woods	66. Franklin's Reading World

Scholastic	67. Talking Text Library- Beginning Classics
	68. Talking Text Library- Classics for Young Readers
	69. Wiggleworks
Sierra On-Line	70. Beginning Reading
	71. Mixed-up Mother Goose
Soleil Software	72. Zurk's Learning Safari
Teacher Support Software	73. Make-A-Book
	74. The Semantic Mapper
Thomson Learning Tools	75. Magic Applehouse
Todd Enterprises	76. Children's Multimedia Encyclopedia
Unicorn	77. Aesop's Fables
	78. Read and Rhyme
	79. The Wonders of the Animal Kingdom
Virgin Sound and Vision	80. Get Ready for School, Charlie Brown
	81. Wiggins in Storyland
Workman/SWFTE International Ltd.	82. Brain Quest- Grades 1 & 2
Zelos Digital Learning	83. Sitting on the Farm

Appendix F

Letter to Publishing Companies

April 10, 1996

Publisher
Street
City, ST 00000

Dear :

Since the 1960's, elementary schools have realized the computer's potential for aiding in classroom instruction, particularly with reading instruction. Research shows that computers can be an effective means of improving students' reading ability. Software publishing companies, like (name of publisher), have also realized that capability and have thus provided educators with a plethora of software to choose from. However, finding software that suits individual schools' and classrooms' needs can often seem like an overwhelming task to educators.

As a Master's degree student at Central Connecticut State University, I am conducting a research study that will be beneficial to educators involved in the teaching of reading. I hope to eliminate for educators several of the steps that are involved in finding software that suits their school's needs. The purpose of the study is to identify quality computer software programs that are proven to be effective for supplementing reading programs at the first and second grade levels.

Effective software will be identified through a 3-tiered assessment process. First, an evaluation device will be developed to rate the effectiveness of selected programs. Those found to rate high will then be used with either a first or second grade class in a "hands-on" situation. The students and teachers will share their reactions to the software after using it.

Once several programs have been identified as quality, a list of titles of those programs that have been proven effective will be published. This list will be available to schools as a resource when they are selecting software to support their reading programs. The results of this research study will also be shared at upcoming reading conventions at the state and international levels.

I invite (name of publisher) to participate in this study by voluntarily providing a complementary review copy of particular reading software programs. In reviewing the reading programs that are available in software catalogs, (name of publisher's) programs entitled (title) and (title) have the potential for fulfilling the necessary qualifications in order to be included in the list of programs found to be effective supplements to reading instruction. I would also be interested in reviewing any software that is soon to be published by (name of publisher) and has what you deem to be promising characteristics for effective instruction.

If you are willing to participate in this study, the Macintosh version of the software can be sent to the following address:

Carolyn J. Case
Department of Reading and Language Arts
Central Connecticut State University
1615 Stanley St.
New Britain, CT 06050

I can be reached Monday through Thursday between 12:00 and 4:00 at (860) 832-2175 to answer any questions you may have regarding this study, or a message can be left at (860) 673-2447. Any assistance you can provide is greatly appreciated and will ultimately benefit educators and students alike. I look forward to hearing from (name of publisher) soon.

Sincerely,

Carolyn J. Case
Graduate student

Diane M. Truscott, Ph.D.
Assistant Professor

Appendix G

Titles Contributed by Publishing Companies

Publisher	Title
Davidson & Associates	1. Davidson's Kid Phonics
Discis Knowledge Research, Inc.	2. Butterflies
	3. What Air Can Do
	4. Cinderella
	5. The Paper Bag Princess
	*6. Discis Fun House- Play to Learn Series
Disney Interactive	7. Winnie the Pooh and the Honey Tree
	8. Lion King
	9. Pocahontas
Dorling Kindersly	10. My First Incredible, Amazing Dictionary
	11. The Way Things Work
	*12. P. B. Bear's Birthday Party
Edmark	13. Imagination Express Series Destination: Ocean
	*14. Imagination Express Series Destination: Rainforest
	*15. Baily's Bookhouse
Entrex Software, Inc.	16. Sugar & Snails and Kitty Cat Tails (demo copy)
The Learning Co.	17. Interactive Reading Journey
	18. Reader Rabbit 3
MECC	19. Word Munchers
	*20. Big Anthony
	*21. Storybook Weaver
Mind Play	22. Jo-Jo's Reading River
Orange Cherry/ New Media Schoolhouse	23. The Wind in the Willows
Soleil Software	24. Zurk's Learning Safari
	*25. Zurk's Rainforest Lab
Teacher Support Software	26. Make-A-Book
	*27. Reading Realities
Virgin Sound and Vision	28. Get Ready for School, Charlie Brown
	29. Wiggins in Storyland

Note. Asterisked titles are titles that were not directly requested but that the publishing company chose to additionally include.

Appendix H

Titles Requested for Preview

Publisher	Title
Tom Snyder Productions	1. Jack & the Beanstalk
Scholastic	*2. Wiggleworks
SWFTE	*3. Brain Quest- Grades 1 & 2
Broderbund	*4. Where in the World is Carmen San Diego- Jr. Detective Edition
Electronic Arts	*5. Eagle-eye Mysteries
Optimum Resource	*6. Stickybear's Reading Room
Random House	*7. Jump Start First Grade
Sierra On-Line	*8. Mixed-up Mother Goose
Educational Publishing	*9. First Steps to Comprehension Concepts

Note. Asterisked titles are those that could not be reviewed for one of the given reasons.

Appendix I

Evaluation Device - Preliminary Form

Criteria to consider when selecting effective software appropriate for supplementing reading instruction at grades 1 and 2

Directions:

Software will be rated according to each criteria listed below in order to determine the effectiveness of its use as a supplement to reading instruction as it is viewed today. Reviewers will rate the software using the criteria according to the following scale:
SA=Strongly Agree A=Agree D=Disagree SD=Strongly Disagree N/A= Not Applicable- (all sections will not apply to every software reviewed)

In order to check the reliability of the evaluation device, please evaluate the wording of each criteria listed according to the following rating system:

C=Clear; the wording is understandable and measures an essential characteristic
S=too Specific; the wording is confusing as it tries to be too specific
B=too Broad; the wording lacks clarity as the concept it covers too broad
I=the wording relies heavily on how the reviewer Interprets the statement
?=characteristic needs further explanation in order to know exactly what's being evaluated

Any additional suggestions regarding the wording or criteria themselves is greatly appreciated and welcomed. Many thanks for your cooperation and participation.

FORMAT

1. The presentation of the software is engaging.	C	S	B	I	?
2. The entertainment level does not interfere with the educational value.	C	S	B	I	?
3. The software offers clear, easily understood voice-synthesized speech.	C	S	B	I	?
4. The student has the option to read the text independently, without the text being spoken by the computer.	C	S	B	I	?
5. The graphics are of high quality.	C	S	B	I	?
6. The graphics support the text.	C	S	B	I	?
7. The software can be used independently by a first or second grade student.	C	S	B	I	?
8. The software is presented in a way that promotes active reading.	C	S	B	I	?
9. The software utilizes high-quality children's literature.	C	S	B	I	?
10. The text can be presented in more than one language.	C	S	B	I	?
11. The format that the information is presented in promotes effective reading.	C	S	B	I	?
12. The software is able to record individual students' interactions and progress.	C	S	B	I	?

Suggestions:

CONTENT

1. The software encourages an appreciation of text. C S B I ?
2. The subject/topic is appropriate for first and second graders (i.e. not too sophisticated nor too simple/immature). C S B I ?
3. The subject/topic is of high interest to first and second graders. C S B I ?
4. The software reflects experiences that first or second graders can relate to or have knowledge of. C S B I ?
5. It encourages students to draw on their prior experiences. C S B I ?
6. The software meets an important educational need. C S B I ?
7. It encourages students to build an understanding of the purpose of texts. C S B I ?

Suggestions:

SKILLS ADDRESSED

1. The skills are developed within an authentic text setting. C S B I ?
2. The software promotes the importance of creating meaning when reading. C S B I ?
3. The skills addressed are appropriate for first or second graders. C S B I ?
4. The software accommodates different reading levels. C S B I ?

Concepts of print:

1. The software reinforces a left to right directionality of reading. C S B I ?
2. The software reinforces letter recognition. C S B I ?
3. The software reinforces the concept of a word. C S B I ?
4. The software reinforces story concept (beginning/middle/end). C S B I ?

Print Skills:

1. The software encourages students to use word identification strategies. C S B I ?
2. The software encourages students to use *a variety of* word identification strategies. C S B I ?

3. The software reinforces decoding using meaning cues.	C	S	B	I	?
4. Syntactic cues are practiced to aid in decoding.	C	S	B	I	?
5. Students are encouraged to draw on their understanding of sentence structure.	C	S	B	I	?
6. The software aids in the strengthening of sight vocabulary.	C	S	B	I	?
7. Voice-synthesized pronunciation of unfamiliar words is available.	C	S	B	I	?
8. Sight vocabulary is developed within authentic text.	C	S	B	I	?
9. Attention is given to visual cues for decoding words.	C	S	B	I	?
10. The software strengthens phonics skills.	C	S	B	I	?
11. The software provides reinforcement of letter/sound relationships.	C	S	B	I	?
12. Structural analysis skills are strengthened.	C	S	B	I	?
13. Students are encouraged to use word parts to decode words.	C	S	B	I	?

Suggestions:

Comprehension:

1. The software strengthens comprehension.	C	S	B	I	?
2. The software encourages students to apply a variety of strategies to comprehend text.	C	S	B	I	?
3. Students are involved in interpreting text.	C	S	B	I	?
4. The software provides questions that provoke thought (i.e. making comparisons, sharing opinions, analyzing information).	C	S	B	I	?
5. More of the questions provoke higher level thinking than asking for recall of information presented in the text.	C	S	B	I	?
6. The software offers adequate feedback for refining comprehension.	C	S	B	I	?
7. The software offers opportunities for predicting.	C	S	B	I	?
8. Students are able to construct meaning by interacting with the text (appealing to the computer for help).	C	S	B	I	?

9. The software can provide definitions of unknown words.	C	S	B	I	?
10. Upon request, the software supplies reworded versions of text that are easier to understand.	C	S	B	I	?
11. Animated graphics are available for illustrating a concept upon request.	C	S	B	I	?

Suggestions:

Activities

1. The activities presented are at an appropriate level for first and second graders.	C	S	B	I	?
2. The activities are adaptable to a variety of ability levels.	C	S	B	I	?
3. The activities are motivating.	C	S	B	I	?
4. The activities are educationally sound.	C	S	B	I	?
5. The activities encourage worthwhile interaction with text.	C	S	B	I	?
6. The activities encourage the reader's use of a variety of strategies for creating meaning.	C	S	B	I	?
7. The students have the opportunity to self-correct mistakes made during the activity.	C	S	B	I	?
8. The activities presented relate to the objectives of the software.	C	S	B	I	?
9. The activities presented encourage attainment of the software's objectives.	C	S	B	I	?
10. The activities encourage the development of language.	C	S	B	I	?
11. The software encourages development of student ability through productive reading activities.	C	S	B	I	?

Suggestions:

Appendix J

Preliminary Form Cover Letter

April 26, 1996

Dear Dr. :

With the semester coming to a close, I am focusing maximum amounts of energy on my thesis, entitled "Computer software that supplements a new view of reading." While technological abilities advance, computer use in the classroom is becoming more prevalent. My goal is to aid classroom teachers in selecting from the plethora of software that is available those titles that are effective because they are consistent with what we know about reading instruction today.

The purpose of this study is two-fold. The first purpose is to create an evaluation device that can be used in determining the effectiveness of computer software that is available for supplementing the reading instruction of first and second graders. This will be accomplished by determining characteristics that are both congruent with effective instruction and utilize the unique features a computer has to offer. Then, this device will be used in a comprehensive review of selected available software. The review will be conducted concurrently by pre-service teachers in Dr. Abed's ETM classes and myself to assure validity of the results. Since the review will be conducted by multiple parties, reliability of the evaluation device is especially important.

I need the help and expertise of our Department of Reading and Language Arts. In order to determine the reliability, I am asking for your participation by providing feedback on the wording of the proposed criteria (see attached). In other words, I need you to evaluate my evaluation to be sure the statements are clear, appropriate, and that they mean what I intended for them to mean. Your thoughtful inspection of and reflection on this evaluation would be greatly appreciated.

If you feel you can help out with this portion of my study, please return the packet to my mailbox by the end of the day on Wednesday, May 1, 1996. The final draft of the evaluation device will be ready for software reviews to begin on Tuesday, May 7. Upon completion of the study, I will be happy to supply you with the results of the study as well as a copy of the evaluation device for your own use.

Since I am at IRA through Wednesday, I will not be available to answer any questions. I hope the explanation of the study and directions are clear. However, if not, Dr. Truscott knows the details of the study and can clarify if further explanation is necessary. Thank you in advance for helping me in this important aspect of my study. Your input is truly respected and needed.

Very Sincerely,

Appendix K

Evaluation Device - Form 1

Instructional Evaluation for First/Second Grade Reading Software

Software Title:____

Publisher:__________________________Grade levels:____________

Required Hardware:____________________________________

____

Key: A = criterion Applicable NA = criterion Not Applicable

Instructional Criteria	**A**	**NA**	**Comment**
FORMAT			
1. Engaging presentation			
2. Sound supports or is related to the text			
3. Clear, easily understood voice-synthesized speech			
4. Provides model of fluent, expressive reading			
5. Option to read text independently			
6. Quality graphics support or are related to text			
7. Utilizes quality children's literature			
8. Multiple language options			
9. Provides storage of individual students' interactions and progress			
10. Accommodates different reading levels			
11. Integrates reading and writing			
12. Entertainment level does not distract from educational value			
13. Provides opportunity to self-correct mistakes			
14. Provides option to return to earlier text for repeated reading			
15. Can be used independently by a first or second grade student			
SUBTOTAL			

CONTENT			
1. Software encourages an appreciation of text			
2. Subject/topic is appropriate for and interesting to first and/or second graders			
3. Reflects experiences that first and/or second graders can relate to or have knowledge of			
4. Encourages students to draw on prior experiences			
5. Aids in building background knowledge			
6. Meets an important educational need			
7. Provides reading opportunities in authentic texts			
8. Content has clarity (logical presentation, sequencing of concepts)			
SUBTOTAL			

Instructional Criteria	A	NA	Comment
SKILLS			
Concepts of print			
1. Reinforces left to right directionality of reading			
2. Reinforces letter recognition			
3. Reinforces the concept of a word			
4. Reinforces story concept (beginning-middle-end)			
SUBTOTAL			
Print Skills			
1. Reinforces decoding using meaning cues			
2. Reinforces decoding using knowledge of sentence structure			
3. Reinforces decoding using sounds in words			
4. Provides reinforcement of letter/sound relationships			
5. Strengthens structural analysis skills (i.e. use of affixes, word parts, word families)			
6. Strengthens automatic sight vocabulary			
7. Provides voice-synthesized pronunciation of individual words that may be unfamiliar			
8. Provides a variety of supported practice for skills presented			
SUBTOTAL			
Comprehension			
1. Encourages use of a variety of strategies for creating meaning			
2. Provides more questions that provoke higher level thinking (i.e. making comparisons, interpreting, analyzing, sharing opinions) than literal recall of information in text			
3. Presents questions at an appropriate level for first and/or second graders			
4. Provides adequate feedback for refining comprehension			
5. Provides opportunities for predicting			
6. Provides definitions of unknown words			
7. Provides reworded text that's easier to understand			
8. Provides animated graphics that illustrate concept or word			
SUBTOTAL			

Overall Comments:

Appendix L

Criteria Used for Analysis 1

Instructional Evaluation for First/Second Grade Reading Software

Software Title:____

Publisher:_________________________Grade levels:____________

Required Hardware:___________________________________

Key: **A** = criterion Applicable NA = criterion Not Applicable

Instructional Criteria	A	NA	Comment
FORMAT			
1. Engaging presentation	●		
2. Sound supports or is related to the text			
3. Clear, easily understood voice-synthesized speech			
4. Provides model of fluent, expressive reading			
5. Option to read text independently	●		
6. Quality graphics support or are related to text			
7. Utilizes quality children's literature	●		
8. Multiple language options			
9. Provides storage of individual students' interactions and progress			
10. Accommodates different reading levels			
11. Integrates reading and writing			
12. Entertainment level does not distract from educational value			
13. Provides opportunity to self-correct mistakes	●		
14. Provides option to return to earlier text for repeated reading	●		
15. Can be used independently by a first or second grade student	●		
SUBTOTAL			

CONTENT			
1. Software encourages an appreciation of text			
2. Subject/topic is appropriate for and interesting to first and/or second graders	●		
3. Reflects experiences that first and/or second graders can relate to or have knowledge of	●		
4. Encourages students to draw on prior experiences			
5. Aids in building background knowledge			
6. Meets an important educational need			
7. Provides reading opportunities in authentic texts	●		
8. Content has clarity (logical presentation, sequencing of concepts)			
SUBTOTAL			

one of these

Instructional Criteria	A	NA	Comment
SKILLS			
Concepts of print			
1. Reinforces left to right directionality of reading			
2. Reinforces letter recognition			
3. Reinforces the concept of a word			
4. Reinforces story concept (beginning-middle-end)			
SUBTOTAL			
Print Skills			
1. Reinforces decoding using meaning cues	●		
2. Reinforces decoding using knowledge of sentence structure	●		
3. Reinforces decoding using sounds in words	●		
4. Provides reinforcement of letter/sound relationships			
5. Strengthens structural analysis skills (i.e. use of affixes, word parts, word families)			
6. Strengthens automatic sight vocabulary			
7. Provides voice-synthesized pronunciation of individual words that may be unfamiliar	●		
8. Provides a variety of supported practice for skills presented			
SUBTOTAL			
Comprehension			
1. Encourages use of a variety of strategies for creating meaning			
2. Provides more questions that provoke higher level thinking (i.e. making comparisons, interpreting, analyzing, sharing opinions) than literal recall of information in text			
3. Presents questions at an appropriate level for first and/or second graders			
4. Provides adequate feedback for refining comprehension	●		
5. Provides opportunities for predicting	●		
6. Provides definitions of unknown words	●		
7. Provides reworded text that's easier to understand	●		
8. Provides animated graphics that illustrate concept or word			
SUBTOTAL			

Overall Comments:

Appendix M

Criteria Used for Analysis 2

Instructional Evaluation for First/Second Grade Reading Software

Software Title: ______________________________

Publisher: ______________________ Grade levels: ______________

Required Hardware: ______________________________

____

Key: A = criterion Applicable NA = criterion Not Applicable

Instructional Criteria	A	NA	Comment
FORMAT			
1. Engaging presentation	●		
2. Sound supports or is related to the text	●		
3. Clear, easily understood voice-synthesized speech	●		
4. Provides model of fluent, expressive reading	●		
5. Option to read text independently	●		
6. Quality graphics support or are related to text	●		
7. Utilizes quality children's literature	●		
8. Multiple language options	●		
9. Provides storage of individual students' interactions and progress	●		
10. Accommodates different reading levels	●		
11. Integrates reading and writing	●		
12. Entertainment level does not distract from educational value	●		
13. Provides opportunity to self-correct mistakes	●		
14. Provides option to return to earlier text for repeated reading	●		
15. Can be used independently by a first or second grade student	●		
SUBTOTAL			

CONTENT			
1. Software encourages an appreciation of text	●		
2. Subject/topic is appropriate for and interesting to first and/or second graders	●		
3. Reflects experiences that first and/or second graders can relate to or have knowledge of	●		
4. Encourages students to draw on prior experiences	●		
5. Aids in building background knowledge	●		
6. Meets an important educational need	●		
7. Provides reading opportunities in authentic texts	●		
8. Content has clarity (logical presentation, sequencing of concepts)	●		
SUBTOTAL			

Instructional Criteria	A	NA	Comment
SKILLS			
Concepts of print			
1. Reinforces left to right directionality of reading			
2. Reinforces letter recognition			
3. Reinforces the concept of a word			
4. Reinforces story concept (beginning-middle-end)			
SUBTOTAL			
Print Skills			
1. Reinforces decoding using meaning cues			
2. Reinforces decoding using knowledge of sentence structure			
3. Reinforces decoding using sounds in words			
4. Provides reinforcement of letter/sound relationships			
5. Strengthens structural analysis skills (i.e. use of affixes, word parts, word families)			
6. Strengthens automatic sight vocabulary			
7. Provides voice-synthesized pronunciation of individual words that may be unfamiliar	●		
8. Provides a variety of supported practice for skills presented			
SUBTOTAL			
Comprehension			
1. Encourages use of a variety of strategies for creating meaning			
2. Provides **more** questions that provoke higher level thinking (i.e. making comparisons, interpreting, analyzing, sharing opinions) than literal recall of information in text			
3. Presents questions at an appropriate level for first and/or second graders			
4. Provides adequate feedback for refining comprehension			
5. Provides opportunities for predicting			
6. Provides definitions of unknown words	●		
7. Provides reworded text that's easier to understand			
8. Provides animated graphics that illustrate concept or word	●		
SUBTOTAL			

Overall Comments:

Appendix N

Observations of Students' Interactions

Observations of students' interactions

Title:____

1. **Ease of use**

2. **Reactions to entertainment level vs. educational value**

3. **Student reactions to the software**

4. **Students' comments during use**

5. **Favorable characteristics of software**

6. **Negative characteristics of software**

7. **Educational value**

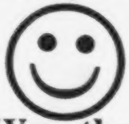
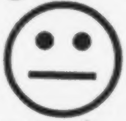
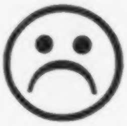
Appendix O

Student Evaluation of Software

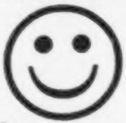
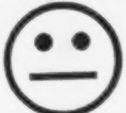
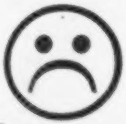
Student Evaluation

Title:____________________________________

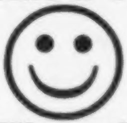
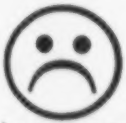
1. **Did you enjoy using the software?**

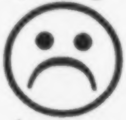
2. **Was the software easy to use?**

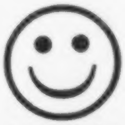




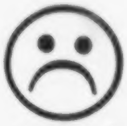
3. **Do you think this software could help you to become a better reader?**

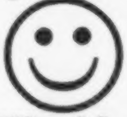
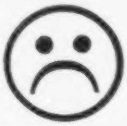
4. **Were the activities in the software too easy, too hard, or just right?**


too easy


just right


too hard

5. **Would you like to use this software on the computer again sometime?**

6. **Would you rather read a book or use this software on the computer?**

read a book **use this software**

7. **What did you like best about the software?**

____

____

8. **What didn't you like about the software?**

____

____

Appendix P

Classroom Teacher's Evaluation of Software

Classroom Teacher's Evaluation of Software

(as observed during students' use)

Title: ____

______________________________________ date: ________

1) When used as a supplement to your existing reading program, would this software aid your students in becoming better readers? Why or why not?

2) What did you like about the software?

3) What didn't you like about the software (what could be changed to make it better)?

4) Would you use the software with your students if it was already available in your school? If no, why not?

5) Would you *purchase* (or recommend that the school purchase) the software for use with your students in your classroom (or the computer lab)? If no, why not?

6) Please respond to what you observed as the students interacted with the software.

Thank you!

Appendix Q

Evaluation Device - Revised

☐ I do recommend the purchase/use of this software

Instructional Evaluation for First/Second Grade Reading Software

Software Title:______________________________

Publisher:____________________Grade levels:__________

Required Hardware:______________________________

____

Overall Score (from Part 2) _____% Excellent Good Fair Poor

(Circle one)

Part 1 - Place a check by all skills that are addressed by the software

Comments

Concepts about print

_____ 1. Reinforces left to right directionality of reading

_____ 2. Reinforces letter recognition

_____ 3. Reinforces the concept of a word

_____ 4. Reinforces story concept (beginning-middle-end)

Print Skills

_____ 1. Reinforces decoding by breaking words into sounds

_____ 2. Reinforces decoding using meaning cues

_____ 3. Reinforces decoding using knowledge of sentence structure

_____ 4. Provides reinforcement of letter/sound relationships

_____ 5. Strengthens structural analysis skills (i.e. use of affixes, word parts, word families)

_____ 6. Strengthens automatic sight vocabulary

_____ 7. Provides a variety of supported practice for skills presented

Comprehension

_____ 1. Encourages use of a variety of strategies for creating meaning

_____ 2. Provides **more** questions that provoke higher level thinking (i.e. making comparisons, interpreting, analyzing, sharing opinions) than literal recall of information in text

_____ 3. Presents comprehension questions that aid first and/or second graders in gaining understanding of text

_____ 4. Provides adequate feedback for refining comprehension

_____ 5. Prompts students to make predictions about the text

_____ 6. Upon command, provides reworded, simplified text that is easier for students to understand

Case, 1996

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Part 2 - Evaluation of criteria present in software
Key: O = Observable N/O = Not Observable

Instructional Criteria	O	N/O	Comment
FORMAT			
1. Presentation engaging to 1st/ 2nd graders			
2. Sound supports, or is related to, the text			
3. Clear, easily understood voice-synthesized speech			
4. Provides model of fluent, expressive reading in which pacing can be controlled			
5. Provides voice-synthesized pronunciation of individual words			
6. Option to read text independently			
7. Provides quality, animated graphics that support text by illustrating concept or word to help create meaning			
8. Utilizes quality children's literature			
9. Multiple language options			
10. Keeps records of individual students' interactions and progress			
11. Accommodates different reading levels			
12. Integrates reading and writing			
13. Educational value exceeds entertainment level			
14. Provides opportunity to self-correct mistakes			
15. Provides option to return to previous text for repeated reading			
16. Provides helpful definitions of unknown words			
17. Can be used independently by a first or second grade student			
SUBTOTAL			
CONTENT			
1. Encourages children to value reading			
2. Subject/topic is appropriate for and interesting to first or second graders			
3. Reflects experiences that first or second graders can relate to or have knowledge of			
4. Encourages students to draw on prior experiences			
5. Aids in building background knowledge about topic prior to reading			
6. Meets an important educational need			
7. Provides opportunity to read for authentic (real) purposes			
8. Content has clarity (logical presentation, sequencing of concepts)			
SUBTOTAL			
TOTAL (x/25) of Format and Content sections			

Percentages (x/25) and Ratings Key

Excellent 24/25 = 96% 23/25 = 92%	**Good** 22/25 = 88% 21/25 = 84%	**Fair** 20/25 = 80% 19/25 = 76%	**Poor** 18/25 = 72% or less

Carolyn Joy Case

Carolyn J. Case completed her undergraduate degree at the State University of New York at Potsdam, where she majored in both Elementary Education and English with an emphasis on writing. She graduated with Magna Cum Laude honors and was a member of the National Honor Societies in Education (Kappa Delta Pi) and English (Sigma Tau Delta).

During her Master's studies in Reading and Language Arts, Ms. Case maintained a 4.0 average, was a Central Connecticut State University (CCSU) graduate fellowship recipient, and a Phi Delta Kappa scholarship recipient while holding the position of graduate/research assistant for the department of Reading and Language Arts. Additionally, she was awarded the 1996 Connecticut Association for Reading Research scholarship for work on her thesis and has presented the results of the study to educators at local elementary schools, in classes at CCSU, and at the Connecticut Reading Association annual conference.

An educator for six years, Ms. Case has taught at the pre-K, first, and second grade levels and is presently a Reading Recovery teacher-in-training through the University of Connecticut at East Farms School in Farmington, CT. She values being a member of Phi Delta Kappa, the International Reading Association, the New England Reading Association, and the Connecticut Reading Association. In the future, she hopes to become a published children's book author.